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AVIATION

The Oldest American Aeronautical Magazine

JANUARY 11, 1926 Issued Weekly PRICE 15 CENTS

The Famous Night Photograph of Rochester, N. Y. (See page 53)

VOLUME XX

NUMBER 2

SPECIAL FEATURES

McCOOK FIELD REVIEW
THE MODOCKO—CY CALDWELL
THE SHENANDOAH COURT FINDINGS

GARDNER PUBLISHING CO., INC.
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225 FOURTH AVENUE, NEW YORK

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ST. LOUIS FLYING FIELD, ANGLUM, MO.

JANUARY 11, 1926

AVIATION

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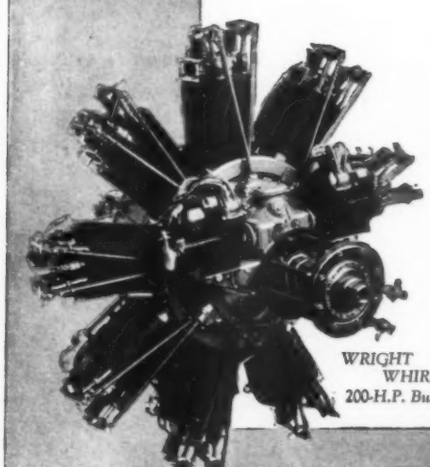

WRIGHT WHIRLWIND
200-H.P. *Bulletin 8A*

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Bulletin 14A

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VOL. XX JANUARY 11, 1926 No. 2

The Shenandoah Court Findings

THE CONFUSED opinions held by the public regarding the causes of the Shenandoah disaster will not be cleared by the report made by the Court of Enquiry to investigate the loss of the airship Shenandoah. It will only serve to make the reaching of any final and unanimous conclusion more difficult. This view does not in any way reflect on the apparent effort of the Court to reach such a definite decision, for some of the findings are so frankly damaging to the Navy that they indicate that the Court would have followed any course no matter how detrimental to the reputations of important officers.

After the accident, AVIATION urged that aircraft be taken out of politics. It is interesting to note that the Court makes a similar recommendation. After stating that there were 248 requests for the Shenandoah to fly over cities in the Middle West and that the Navy had "directed the commanding officer of the Shenandoah to submit an itinerary for a mid-west flight to pass over as many of certain specified cities as practicable on dates in the early part of September when state and county fairs were scheduled to be held", the Court makes the following sweeping recommendation:

"While recognizing the propriety and necessity of the legally constituted authorities in the Naval service being the sole judges of the sufficiency of the reasons actuating all orders to naval craft, and further recognizing that the practice of ordering the movement of naval vessels for the purpose of complying with public requests is in accord with long established custom, it is considered that such movements should be limited to essentially naval and military operations in so far as possible, especially in the case of new and experimental types."

While this recommendation is directed to future exhibitions of naval craft, it carries with it an implied rebuke that should not be overlooked or forgotten. The findings indicate that deterioration of structural material was not a direct or indirect cause of the loss of the airship. It does, however, state that some of the changes that were made in the design of the airship may have had an influence on the breaking up of the Shenandoah. The change, resulting in a reduction of the number of gas valves was "inadvisable", it is asserted without reservation. It advises a development of parachutes that may be worn on airships without inconveniencing the action of the crew, once again indicating a criticism of an omission rather than a commission.

While the findings as a whole indicate a most impartial and searching investigation, it is difficult to read it without receiving the impression that had the wording of the report been left to a tribunal of men not in the Navy, there would have been a greater freedom of expression, and some of the report would have not been couched in such explanatory language. The impression is given that there was really no one to blame, but that the whole responsibility was on the weather. Perhaps this is the best way to leave the final word. As the Court says "whether the ship if entirely intact and undamaged, would have broken under the forces existing, or whether prior minor damage due to gas pressure was a determining factor in the final breakup, are matters which this court is unable definitely to determine". The exact cause therefore will never be determined officially and this greatest of all airship disasters will go down into history as another of the airship wrecks that had an unknown cause.

The Sphere of the Three Engine Airplane

THE TECHNICAL advances which have been made in the design of aero engines are bringing closer the possibilities of the three engine airplane for commercial as well as private use. The rendering of transport by airplanes immune, for all practical purposes, from forced landings resulting from engine failure is almost assured. As this is the cause of the great majority of interrupted cross-country flights, its importance in the development of air transportation, should not be overlooked.

At the present stage of development, the weight per horse power of an engine does not actually vary in proportion with the power. That is to say, present day low powered engines weigh per horse power, more than the larger engines. The effect of this upon modern design will be that a plane requiring a given power, if it is to incorporate the three engine principle, will have a smaller amount of pay load carrying capacity than a similar single engine plane of equal horse power, though this deficiency will probably not be very great. On the other hand, the almost complete freedom from forced landings will be very important to air transport and, in fact, to all forms of aerial service.

The problem calls for very careful consideration and will probably require different solutions according to the nature of the aerial services to be performed. The lower cost, cheaper maintenance and, possibly, superior aerodynamic performance, even if only to a slight degree, of the single engine design, will naturally continue to make this type the most used.

On the other hand, however, it would seem unlikely that any regular air passenger transportation service would ever be a success while there was even the smallest possibility of a forced landing. Passengers will continue to be reticent in adopting air travel while there is any chance of their journey being interrupted and not carried out to schedule.

It seems safe to predict, therefore, that the three engine airplane will be an absolute necessity to the successful operation of a passenger carrying air transport project. In such a case a passenger airliner will be equipped with three small engines together totaling the required maximum horse power necessary for taking off and climbing, or in making headway against the highest headwinds which might be met with. Under normal conditions the plane would be flown on two-thirds or three-quarters throttle for all engines, just as in a single engine plane. but in the event of failure of any one engine, the power of the other two at full throttle will be sufficient to maintain level flight until a destination is reached.

The Modocko

a la Gilbert and Sullivan

Adapted by CY CALDWELL

A Musical Extravaganza in Two Acts

Dramatis Personae

THE MODOCKO, *Ancient Ruler of the Air*
AVEY-AYSHUN, *his daughter,* in love with Billi Mitch
BILLI-MITCH, *a flying minstrel,* in love with Avey-Ayshun
REID-POO-POO, *Lord High Questioner,* Juggler of the Word
KO-KO, *Lord High Executioner and Judge of the Court*
WILL-BAH, *Secretary of the Gravy,* in love with Avey-Ayshun
PISH-TUSH, *Secretary of Snore,*
slightly in love with Avey-Ayshun
POOH-BAH, *an elderly gentleman in charge of Anti-aircraft battery. Chorus of pilots, mechanics, generals, admirals, reporters, and, away off in a corner, the American Public.*

Act. I. A flying field at Titipu.

Act. II. A court-room at White-wash-ington.

Act I

SCENE: *Flying Field at Titipu. Old DH in foreground.*
Enter: Chorus of pilots and mechanics, singing very dolefully:

We are gentlemen of the air,
Without a worry or care.
We're covered with grease and paint;
Our attitude's queer and quaint—
You're wrong if you think it ain't.
We believe we are worked by strings
Like a commonplace marionette.
We don't understand these things—
It's De-part-men-tal Et-i-quette.

Enter, Billi-Mitch, with toy airplane on string, singing.

A wand-ring minstrel I, a thing of shreds and patches;
Battleships, bombs and crashes,
Are my dreamy lullaby.
My testimony's long, thro' every passion ranging,
And to my humor changing, I tune my airy song.

Enter Pooh-Bah, accompanied by anti-aircraft battery.

POOH-BAH:

Our great Modocko, virtuous man,
When he to rule the air began,
Resolved to try a plan
Whereby young men might best be steadied.
So he decreed in words succinct,
That all who flirted, leered, or winked,
(Unless connubially linked,)
Should forthwith be beheaded, be-headed, be-headed.

Chorus, by anti-aircraft battery:

And you are right, And we are right,
And all is right, as right can be!
Although we never hit it,
And usu-ally miss it.

POOH-BAH:

This stern decree, you'll understand,
Caused great dismay throughout the land:
For young and old, and shy and bold,
Were equally affected.
The youth who winked a roving eye,
Or breathed an anti-aircraft sigh,
Was thereupon condemned to die.
He usually objected, ob-jected, ob-jected.

Chorus, by anti-aircraft battery:

And you are right, and we are right,
And everything is quite all right,
No one has objected.

Enter Avey-Ayshun. Billi-Mitch winks at her, is straightway arrested and hauled rapidly from sight.

POOH-BAH:

Young man, despair, likewise go to,
Avey the fair you must not woo.
It will not do, I'm sorry for you,
I'm really quite dejected, de-jected, de-jected.

Chorus by anti-aircraft battery:

And you are right, and we are right,
And everything is quite all right,
No need to be dejected;
It was to be expected, ex-pected, ex-pected.

Chorus by entire company:

On a tree by a river an old pilot sat,
Singing, "politics, politics, politics!"
And we said to him, pilot, oh, why do you sit,
Singing, "politics, politics, politics?"
"Is it weakness of intellect, pilot," we cried,
"Or some tough army rations you've taken inside?"
With a shake of his poor greasy head, he replied,
"Politics, politics, politics."
He slapped on his chest as he sat on the bough,
Singing "Politics, politics, politics!"
And a cold perspiration bespangled his brow,
"Oh, politics, politics, politics!"
He sobbed and he sighed and a gurgle he gave,
Then threw himself into the billowy wave,
And an echo arose from the suicide's grave,
"Oh, politics, politics, politics!"

Act II

SCENE: *The court-room at White-wash-ington.*
Lord High Executioner and Judges, all generals and citizens. Will-Bah, Pish-Tush, Pooh-Bah, with reporters and citizens are crowded in court-room, a dilapidated old barn. Army mule and Navy goat are tethered at rear, with elephant and donkey, representing two great powers in the land. Billi-Mitch is brought in, securely bound, followed by the Lord High Questioner Reid-Poo-Poo with a trunk full of evidence.

KO-KO:

As some day it must happen that a victim must be found,
I've got a little list; I've got a little list,
Of society's offenders who might well be underground,
And who never would be missed, who never would be missed.
There's the pestilential nuisances who say the navy's wet,
That prohibition is a farce and ain't succeeded yet.
Investigating boards that ask us questions that embarass,
Who pry around and find out things and gen-er-ally harass.
They'd none of 'em be missed; I've put them on my list.

Chorus by Judges:

He's got 'em on the list;
They'll none of 'em be missed.

KO-KO:

There are miserable pilots who have claimed our planes are old,
And that when we bought them new ones, we were gen-er-ally sold.
We've got them on the list!
And the guy with new opinions; Who speaks 'em out so bold,
He never would be missed;
He never would be missed.
And the idiot who praises in enthusiastic tone,
All aviation services but this one of our own,—

Chorus by Judges:

Oh, put them on the list.
They'd none of 'em be missed.
All critics in the papers,
Who just now are rather rife,
Please put them on the list!
All funny writers, comic men,
And clowns of private life,
They'd none of 'em be missed.
We know they'd not be missed.

Reporters are scribbling busily. Telegraphers are sending reports of judge's speech all over the country. The donkey and the elephant and the goat and the mule, raise an uproar of enthusiasm. Airplane is heard to crash, backstage. Someone had leaned against it, and it fell apart.

BILLI-MITCH:

With aspect stern and gloomy stride,
I've come to learn how you decide.
Don't hesitate to state my fate,
Oh; do I stay, or get the gate?

PROSECUTING ATTORNEY:

I heard one day a gentleman say,
That criminals who are cut in two,
Can hardly feel the fatal steel.
And so are slain,
Without much pain.
If this is true,
It's jolly for you.
Your courage screw,
To bid us adieu.

WILL-BAH, *Secretary of the Gravy:*

This Billi-Mitch must yield to me.
Avey-Ayshun he must surrender.
Now I adore that girl with passion tender.
And could not quit her with a ready will,
Or her allot, if I did not,
Adore myself with passion tend'rer still.

Chorus by reporters:

Ah yes, he loves himself
With passion tend'rer still.
Wire the news to dale and hill,
And send the Editor the bill.

WILL-BAH:

I cannot swim, I cannot float,
I cannot even row a boat.

Chorus by judges:

No wonder you are ruler of the whole Nay-vee!
So let us then your suit advance,
With laughing song and merry dance.
With joyous shout and ringing cheer,
Congratulate your fine career.

PISH-TUSH, *Secretary of Snore:*

With Avey-Ayshun I have played;
Who doubts that I can make the grade?
You should see me on parade
With anti-aircraft plans all laid.

PROSECUTING ATTORNEY:

This Billi-Mitch has winked at Avey,
Beloved of Will-Bah of the Gravy,
Has raised a feeling sad and sore,
Inside of Secretary Snore.

KO-KO *(addressing Will-Bah and Pish-Tush)*

There is beauty in extreme old age,
Do you fancy you are elderly enough?
Information I'm requesting,
On a subject interesting.
Will Avey-Ayshun love you 'cause you're tough?

WILL-BAH and PISH-TUSH, *Duet:*

Throughout this wide dominion,
It's the gen-er-al opinion,
That we'll treat her very tender if we're tough.

KO-KO:

There's a fascination frantic,
In two ruins so romantic.
Do you think you are sufficiently decayed?

WILL-BAH and PISH-TUSH:

To the matter that you mention,
We have given some attention.
We are sure we are sufficiently decayed.

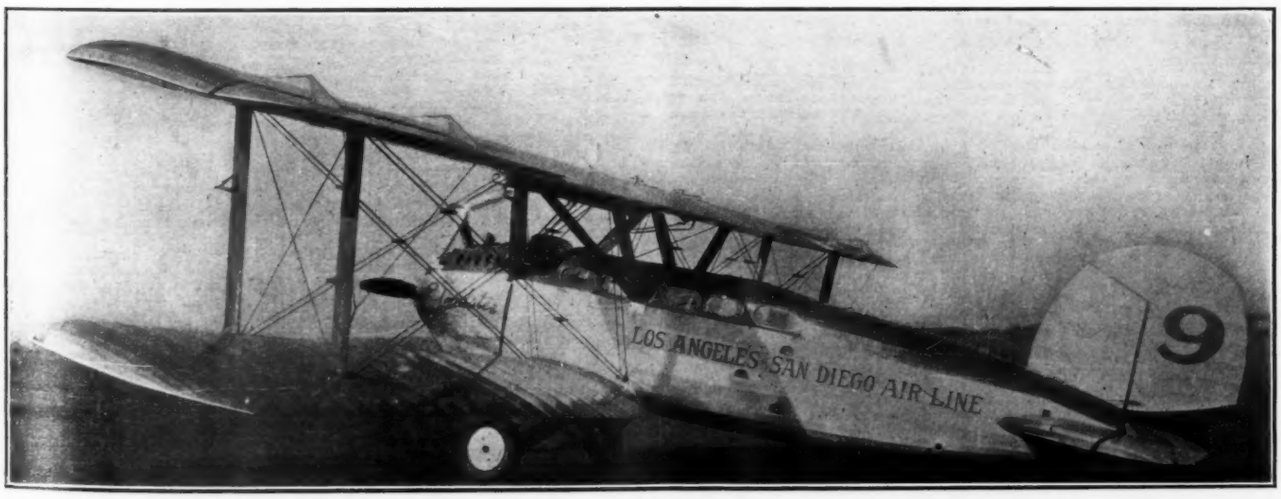
KO-KO:

Then decide which of you take her.
I'll attend to this young faker. (turning to Billi-Mitch)
You will sit in solemn silence in a dull, dark dock,
In a pestilential prison with a life-long lock,
Awaiting the sensation of a short, sharp shock,
From a cheap and chippy chopper on a big black block.

Chorus by entire company:

From now Billi-Mitch will be dumb, dumb, dumb,
Your anger please bury, for all will be merry.
I think he had better succumb, cumb, cumb,
And join our expressions of glee.
His notions, though many,
Are not worth a penny.
The word for his guidance is mum, mum, mum,
As I think you will gladly agree.

Curtain.



The "Cloudster" cabin passenger plane used on the Los Angeles-San Diego airline operated by the Ryan Flying Company

The Shenandoah Court Findings

The Court of Inquiry Resolves Its Report into a Series of Facts and Opinions Relating to the Shenandoah in Particular and Airships in General.

THE Court of Inquiry convened by the Secretary of the Navy to inquire into all the facts and circumstances connected with the loss of the U.S.S. Shenandoah in Noble County, Ohio, on the morning of Sept. 3, 1925, has completed its work and forwarded its findings to the Secretary of the Navy, who has submitted the report to the Chiefs of the Bureaus of the Navy Department for technical comment. After its return from the Bureaus, the Secretary will make a study of the court proceedings before finally acting upon them.

The Court assembled on Sept. 21, 1925, and holding sessions on 31 days, has examined some 65 witnesses, including all of the survivors of the Shenandoah, except one, who was ill in a hospital, and including experts of wide reputation. About 2100 pages of testimony is included in the Court's record, besides numerous technical reports, papers, diagrams, charts and photographs. The Court of Inquiry also had before it the results of the Board of Investigation convened at the scene of the accident, which Board interrogated numerous eye witnesses to the accident.

The findings alone of the Court, amount to over 4,000 words and are classified as "Facts" and "Opinions", covering phases of design, construction, and operation of the Shenandoah, as well as of the midwest flight and final destruction of the ship. A number of recommendations, suggestions, and ideas, designed to further the development of rigid airships, are included in the findings and more of such will be revealed through a study of the mass of technical data included in the complete record of the Court as soon as this data has been suitably collated.

The Court consisted of: Rear Admiral Hilary P. Jones, U.S.N., president, Capt. L. B. McBride, (C.C.), U.S.N., Commander John Towers, U.S.N., and Maj. Henry Leonard, U.S.M.C. (retired), Judge Advocate.

The full text of the Court findings is herewith reprinted:

The court having thoroughly inquired into all the facts and circumstances connected with the loss of the U. S. S. Shenandoah, and having considered the evidence adduced, finds as follows:

I. Matters entirely antecedent to the inception of last trip of Shenandoah but having a material bearing on this inquiry.

Facts.

1. The design of the Shenandoah was begun under the cognizance of the Bureau of Construction and Repair in 1919. When the Bureau of Aeronautics was created and organized in 1921 all matters connected with the design and construction of the airship were transferred to that bureau.
2. At the request of the Bureau of Aeronautics the National Advisory Committee on Aeronautics appointed a technical committee of five, composed of scientists and engineers of national reputation, to examine the design, methods and assumptions used, as well as the actual design of the Shenandoah. This committee after prolonged study completely approved the design of the airship as prepared.
3. The airship was built at the United States Naval Air Station, Lakehurst N. J., was completed in 1923, made its first flight on Sept. 4, 1923, and was commissioned as the U. S. S. Shenandoah in October of the same year.
4. In the design of the Shenandoah approximately 4 per cent more of the total lift was assigned to the hull structure and fittings, than in the design of certain foreign rigid airships for which comparative figures were available. As finally completed, the weight of the ship exceeded the designed weight by approximately 1 per cent.
5. The only major casualty suffered by the Shenandoah prior to the start of the Midwest flight occurred in January, 1924, when it was torn from the mooring mast at Lakehurst by stress of weather. The ship was thoroughly inspected and repaired after this accident.
6. Prior to the Midwest flight, the Shenandoah had cruised a total of approximately 740 hr. in the air, covering approximately 25,835 statute ground miles, of which 605½ hr. and 20,761 mi., including a transcontinental flight, were made subsequent to Jan. 16, 1924.
7. A majority of the officers and crew had served in the Shenandoah continuously from the time of commissioning up to and including the Midwest flight of Sept. 2, 1925. Many of these had received previous training on rigid airships abroad.
8. In accordance with the provisions of the National Defense act of 1920, and upon recommendation of the Joint Army and Navy Board, approved by the Secretaries of War and Navy, the Navy was charged with the sole responsibility for the procurement and development of rigid airships for use over both land and water.
9. The U. S. S. Los Angeles was obtained through an international agreement that it should be used for commercial purposes only and was assigned to the Navy for operation. The Navy is charged with the development of rigid airships for commercial as well as for military purposes.

Opinions.

1. The Shenandoah represented the best practices in design and construction at the period of its building.
2. The proportionately greater weight for structure and fittings of the Shenandoah resulted in increased strength.
3. The damage to the Shenandoah due to breaking away from the Lakehurst mooring mast was fully repaired and no loss of strength ensued as a result thereof.
4. The officers and crew of the Shenandoah were skilled and competent operators of rigid airships.
5. The operation of right airships over land, as well as over the sea, is a proper and powerful function of the Navy.

II. Matter leading up to the flight of the Shenandoah; beginning Sept. 2, 1925.

Facts.

10. The Navy Department had received 248 requests from public officers, public and semi-public bodies and individuals for a flight of a rigid airship over the Middle West.
11. On June 7, 1925, in obedience to orders from the Navy Department, the Los Angeles started a flight to Minneapolis, but due to engine trouble returned to Lakehurst in accordance with the decision of the commanding officer after completing only the first part of the flight.
12. On June 9 the Chief of Naval Operations informed the commanding officer of the United States Naval Air Station, Lakehurst, and the commanding officer of the Shenandoah that that airship, which was then deflated, would be ordered to make the trip previously scheduled for the Los Angeles as soon as the former could be made ready, helium transferred and the airship placed in active service.
13. In letter dated June 15 the commanding officer of the Shenandoah recommended that such a flight be postponed until September on account of the probability of unfavorable weather conditions in the Midwest during July and August. Prior to the receipt of this letter the Chief of Naval Operations had issued orders, dated June 19, for a flight over the Midwest by the Shenandoah as soon as ready.
14. Upon its receipt, the letter to the commanding officer of the Shenandoah of June 15 was considered by both the Chief of Naval Operations and the Chief of the Bureau of Aeronautics. As a result the commanding officer of the Shenandoah was ordered to Washington for consultation. On June 30 the consultation was held, at which the Chief of Naval Operations, the Chief of the Bureau of Aeronautics, the commanding officer of the Shenandoah and the head of the Ships' Movement Division of Operations were present.
15. As a result of this conference the orders of June 19 were revoked.
16. A mooring mast for rigid airships had been erected at Detroit, Mich., by Henry Ford, and was completed about July 9. The Navy Department had been requested to send a rigid airship to Detroit to test this mast, the first to be erected in this country by private enterprise.
17. In letter dated July 20 the Chief of Naval Operations directed the commanding officer of the Shenandoah to submit an itinerary for a Midwest flight to pass over as many of certain specified cities as practicable on dates in the early part of September, when State and county fairs were scheduled to be held, and to test the mooring mast at Detroit.
18. In a reply dated Aug. 4, the commanding officer of the Shenandoah recommended two separate flights, the first during the last week in August to Detroit to test the new mooring mast and the second beginning Sept. 7 over the entire route covering the specified cities.
19. The Chief of Naval Operations after consultation with the Chief of the Bureau of Aeronautics, directed one flight only in lieu of two, this flight to begin Sept. 2. The orders dated Aug. 12 directed this flight.

Opinions.

6. The commanding officer of the Shanandoah was fully consulted and given every opportunity to state his views in regard to the midwest flight.
7. The commanding officer of the Shenandoah did not at any time express opposition to or any reluctance in undertaking the flight beginning Sept. 2 on the ground of possible adverse weather conditions.
8. The object of the midwest flight was threefold, viz.: to test the mooring mast at Detroit, to continue training of personnel and to comply with many requests received from citizens of that section of the country that such a flight be made.
9. While recognizing the propriety and necessity of the legally constituted authorities in the naval service being the sole judges of the sufficiency of the reasons actuating all orders to naval craft, and further recognizing that the practice of ordering movements of naval vessels for the purpose of complying with public requests is in accord with long-established custom, it is considered that such movements should be limited to essentially naval and military operations insofar as possible, especially in the case of new and experimental types.

III. The condition of ship and crew at time of flight.

Facts.

20. The ship was fully manned and equipped and in material readiness for flight.
21. Frequent and careful inspection of the entire structure of the ship had been made throughout its life. In addition material similar to that in the structure of the ship had been kept under observation and been subjected to tests under instructions of the Chief of the Bureau of Aeronautics.
22. Extensive tests of material selected from widely separated parts of the structure after the wreck were made by the Bureau of Standards.
23. Both sets of tests have shown a limited deterioration of the material in the form of intercrystalline corrosion, which deterioration to the extent found does not affect in any substantial degree the ultimate tensile or compressive strength or the modulus of elasticity of the material but does largely reduce its ductility.
24. The design of the structure of the Shenandoah was based on ultimate failure of individual girders in compression. The design of these individual girders was such that under compression they would fail through flexure by instability. This failure would occur before the stress in the separate members of the girder had reached the elastic limit of the material and was therefore dependent upon the modulus of elasticity only and not upon the ultimate strength of the material.
25. In letter dated Sept. 16, 1924, the commanding officer of the Shenandoah first proposed certain changes in the system of gas valves of the ship and subsequently renewed his recommendations in letters dated Dec. 15, 1924, Jan. 9 and May 12, 1925, and in telephone conversation of May 28, 1925. The commanding officer of the Naval Air Station, Lakehurst, concurred in this recommendation. Although the Bureau of Aeronautics at first questioned the advisability of this change, it finally

approved it in letter of May 28, as an experimental installation, and in letter of June 13 transmitted to the commanding officer of the Shenandoah a design memorandum showing the effect of this change in reduction of the maximum safe rate of rise above pressure height of an airship so equipped. This change, involving a reduction in number of automatic valves, was made the latter part of May and early part of June. As a result the Shenandoah was equipped with automatic valves in gas cells Nos. 4, 5, 8, 9, 12, 13, 16 and 17 and with maneuvering valves in gas cells Nos. 4, 6, 7, 10, 11, 14, 15 and 18. Subsequent to this change and prior to the midwest flight the Shenandoah had cruised about 186 hr., covering about 6,750 statue ground miles, not including midwest flight.

26. Certain other changes, not contemplated in the original design, including removal of No. 6 engine, installation of water recovery apparatus, removal of manometers due to the fact that no entirely satisfactory type has yet been developed and other minor alterations, were made subsequent to the completion of the Shenandoah.

27. The Shenandoah was equipped with only two parachutes, which were carried for the purpose of landing personnel in order to make ground preparations in case it became necessary on any flight to make an emergency landing at a point where preparations had not previously been made.

28. The manual of the Bureau of Aeronautics required: "Parachutes—(a) Parachutes will be worn by all personnel in all types of aircraft when available. Specific exemptions may be made by commanding officers when their use increases the hazards of the personnel." The established practice at the Naval Air Station, Lakehurst, on both the Shenandoah and the Los Angeles was to carry only two parachutes.

29. The officers and crew of the Shenandoah were well organized, well trained and highly skilled in performance of their duties.

Opinions.

10. Deterioration of structural material was not a direct or indirect cause of the loss of the ship.

11. The deterioration shown to exist was not due to local causes but was generally distributed throughout the structure. It was not due to any lack of care or inspection in its manufacture and fabrication nor to neglect of proper measures for care and preservation in the ship after completion.

12. The court concurs in the opinions of expert witnesses that the rate of deterioration would not affect the safety of the structure of an airship for a much longer period than that covered by the life of the Shenandoah.

13. Material of this character will, until more thoroughly known and understood, require careful handling and observation during fabrication and while in service, but no evidence adduced before this court indicates that its use in the structure of rigid airships is unsafe or inadvisable.

14. The court concurs in the opinions of all qualified experts in the operation of rigid airships, who appeared before it, that the wearing of the present type of parachutes would add to the general risks and hazards of handling such ships due to their interference, especially in emergencies, with the quick and efficient performance of duty by the personnel. The court is, therefore, of the opinion that the judgment of the commanding officer in regard to carrying parachutes was sound. The present practice is adequately covered by the paragraph in the Manual of the Bureau of Aeronautics quoted in F-28.

15. None of the changes referred to in F-26 were contributory to the loss of the ship. The successful development of a thoroughly dependable type of manometer or gas pressure gauge giving accurate readings in the control car for each gas cell would be a contribution to safe operation of rigid airships.

16. Every effort should be made to develop and perfect such type of parachute as could be worn in an emergency without undue handicap in the performance of duty.

IV. The flight from start to about 5:22 A. M. (Eastern Standard Time), Sept. 3, 1925.

Facts.

30. The flight was made in obedience to lawful orders, issued by competent authority and containing a prudential clause as follows: "Should the dictates of safety and the weather conditions existing make it advisable, the commanding officer of the Shenandoah is authorized to make such modifications in the above itinerary as he deems necessary, remembering, however, that this route will be published in the press and that many will be disappointed should the Shenandoah fail to follow the approved schedule."

31. Before leaving the Naval Air Station, Lakehurst, the commanding officer of the Shenandoah obtained and considered in consultation with the aerological officer of the ship the latest weather maps and reports.

32. The Shenandoah left the mooring mast at the Naval Air Station, Lakehurst, at 2:52 p. m. Sept. 2, and proceeded on the midwest flight.

33. The 8 p. m. weather reports were received, mapped and studied by the aerological officer about 11:30 p. m. Sept. 2. The scheduled weather report from Lakehurst for the region being traversed was received about midnight. These reports were discussed by the aerological officer with the executive officer who was on duty in the control car.

34. Between 3 and 3:30 a. m. the commanding officer, executive officer and aerological officer, all of whom were in the control car, observed and discussed the first apparently unfavorable weather conditions. For the next two hours the weather conditions were under constant observation and discussion by the commanding officer and the aerological officer, who were in complete agreement in their conclusions except at one point when the aerological officer advised a change of course to the south. The commanding officer, after consideration and discussion, which developed that the aerological officer based his opinion not on any close or immediate danger but on the unusual movements of storm areas twenty-five to fifty miles to the northward, decided to adhere to the course of 260 degrees true.

Opinions.

17. The commanding officer was entirely justified in starting the flight at the time chosen, as the weather maps and reports indicated nothing which would have rendered it unsafe or inadvisable.

18. The weather reports which were received and mapped between 11 p. m. and midnight, Sept. 2, indicated nothing which rendered it unsafe or inadvisable to proceed.

19. A more extensive meteorological service, which would require more weather stations and more frequent broadcasting of reports, probably would greatly have contributed to the safe navigation of the Shenandoah on this trip.

20. Although subsequent events showed that a change of course to south when suggested by the aerological officer would have been advisable, the commanding officer's decision to maintain his course was a matter for his decision only, was made on his best judgment after discussion and consideration, and was based on the facts and conditions as then known or observed. Any error of judgment involved in this decision was entirely without negligence or blame.

V. The flight from 5:22 A. M. to 5:47 A. M. (Eastern Standard Time).

Facts.

35. During this period constant watch was kept on aerological conditions by the commanding officer and the aerological officer, but none of the usual cloud formations indicating abnormal air currents in the immediate vicinity of the ship was observed.

36. Prior to arrival at pressure height, all valve covers had been removed.

37. At the beginning of this period the Shenandoah was proceeding on a course 300 degrees true at a height of 1,800 ft., but was making little or no ground speed due to strong adverse winds. The airship at this time had a presure height of 3,800 ft. At 5:22 a. m. the airship began to rise under the influence of verticle air currents; rose to a height of 3,150 ft. in eight minutes; was brought under control and steadied at that level for six minutes; then rose again and more rapidly to 6,100 ft. in ten minutes; dropped rapidly to 3,000 ft. in three minutes, and finally rose again, sharply up by the nose, to probably 3,700 ft., at which point the ship broke. This last rise was accompanied by a movement of rotation of the whole ship in a horizontal plane and by violent rolling and pitching. During all these movements the ship was out of control. All the above figures are approximate only.

38. The average rate of rise during the first part was 170 ft./min.; during the second part 300 ft./min., with a probable maximum of 700 ft. in the last forty-two seconds. The average rate of fall was 1,000 ft./min. The rate of the final rise is not ascertainable, but is immaterial, as the ship broke before reaching pressure height.

39. The existence of high velocity vertical air currents without accompanying cloud formations or other visible indications is unusual, but is a phenomenon known to meteorologists.

40. During this period of uncontrolled movements various recognized methods for bringing the ship under control, such as opening the maneuvering valves for five minutes, nosing down by means of controls, speeding up engines and letting go ballast, were utilized, but without result so far as obtaining full control of the movements of the ship was concerned.

41. The following sequence of events in the final destruction of the ship is indicated by the evidence. At or about the time the ship was at its highest altitude unusual sounds within the body of the ship were heard. These sounds are variously described by different witnesses, but seem clearly to indicate the existence at that time of unusual stresses in some part or parts of the structure. The sharp rise by the nose, the rotation in horizontal plane and the rolling and pitching of the ship during final uncontrolled rise indicate the existence of large unbalanced external aerodynamic forces acting on the ship at that time. The next abnormal event was a cracking of the struts on the control car. The first break in the main structure of the ship occurred between frames 120 and 130, resulting in separating the ship into two parts, the control car remaining attached to the forward section. In something less than a minute thereafter the control car broke loose from the forward section and dropped to the earth. About the same time a second break occurred in the after-section of the ship between frames 100 and 110. The midship action thus broken off, with power cars Nos. 4 and 5 attached thereto, dropped almost directly. The after-section dropped more slowly and was carried by the wind a distance of about one-third of a mile before reaching the earth. The forward section was operated as a free balloon by the personnel left therein and was landed safely about twelve miles from the scene of the disaster.

Opinions.

21. During this period the measures taken by the commanding officer to bring the Shenandoah under control were in accordance with the best-established practice.

22. During this period of extreme danger the conduct of all officers and men was deserving of the highest praise. The commanding officer showed skill, courage, and fine qualities of leadership. All other officers and men showed an intimate knowledge of their duties, fine discipline and morale and great courage. The handling of the forward section of the ship as a free balloon by Lieutenant Commander Rosendahl and Lieutenant Mayer was particularly deserving of commendation.

23. Although testimony of both operating and scientific experts is to the effect that, subject to certain qualifications, gas pressures sufficient to produce permanent strains or actual damage in the structure probably did not exist at the highest point of rise of the ship, the facts (a) that sounds of a nature indicating unusual stresses in the structure were heard at this time, (b) that the calculations on which expert testimony is based are arrived at through assumptions which are of necessity open to error, and (c) that some of these assumptions for their validity depend upon precision in the action of personnel and material, all taken together justify the opinion that gas pressure due to altitude and rate of rise may well have reached values sufficiently high to produce some damage to structure.

24. The exact nature or extent of this damage is not ascertainable, but was probably not sufficient to have endangered the ship under normal operating conditions.

25. Valve covers having been removed prior to arrival at pressure height, they could not have had any influence on the loss of the ship. Nevertheless, the practice of leaving any valve covers in place at any time after an airship takes the air is considered unsafe and inadvisable.

26. The final destruction of the ship was due primarily to large, unbalanced, external, aerodynamic forces arising from high velocity air currents. Whether the ship, if entirely intact and undamaged, would have broken under the forces existing, or whether prior minor damage due to gas pressure was a determining factor in the final break-up, are matters which this court is unable definitely to determine.

27. The change resulting in a reduction of the number of gas valves was inadvisable. The initiation and urging of this change by the commanding officer of the Shenandoah, the recommendation for its approval by the commanding officer of the Naval Air Station, Lakehurst, and its final approval as an experimental instalation by direction of the Chief of Bureau of Aeronautics appear, in the light of subsequent events, to have been errors of judgment, but were arrived at after full and careful consideration by the most expert officers of the Navy in the operation and design of rigid airships, and do not in any way involve negligence or culpability.

28. Although the disaster to the Shenandoah indicates that a rigid airship can probably be destroyed through external aerodynamic forces only, and that such forces can arise from air currents unaccompanied by visible signs recognizable by aerologists in the present state of knowledge, it is the opinion of the court that such conditions and combinations of circumstance are unusual, and such a conclusion does not, therefore, throw doubt upon the safety and utility of rigid airships to a materially greater

degree than does the fact that other types of craft for navigation in the air or on the water are likewise subject to destruction through unusual dangers which cannot invariably be foreseen and provided against.

VI. Loss of life.

Facts.

42. The following officers and men lost their lives through the destruction of the Shenandoah:
Lieut. Comdr. Zachary Lansdowne,
Lieut. Comdr. Lewis Hancock Jr.,
Lieut. John B. Lawrence,
Lieut. Arthur B. Houghton,
Lieut. Edgar W. Sheppard,
Everett P. Allen,
Charles H. Broom,
James W. Cullinan,
Ralph T. Joffray,
Celestino P. Mazzuco,
James Moore Jr.,
Bartholomew O'Sullivan,
George C. Schnitzer,
William H. Spratley.

43. Chief Gunner Raymond Cole received slight injuries and Aviation Chief Rigger John F. McCarthy was seriously injured.

44. Of those lost, eight were in the control car, four in power cars 4 and 5 and two in the body of the ship at the time of the disaster.

45. The control car broke away from the forward section of the ship after the main break in structure and this minor break was probably a direct consequence of the major break. The method of attachment of the control car to the main structure was the same in its general characteristics as that employed on practically all previous rigid airships, i. e., suspension cables for completely supporting its weight, combined with struts only sufficiently strong for steadying the car in flight and designed to collapse before injurious stresses could be transmitted to the main structure in case of contact with the ground when making landings. This general method of support is similar to that employed for the suspension of power cars. Two rigid airships, designed and constructed since the Shenandoah, embody a new and improved type of control car which is directly attached by structural members to the main frame work of the ship.

Opinions.

29. The deaths of all personnel resulting from this accident were due to injuries received in the line of duty and were not the result of their own misconduct.

30. The injuries of all personnel were received in the line of duty and were not the result of their own misconduct.

31. Although the design of the control car and its method of suspension were in accordance with sound and well-established practice at the time of the building of the Shenandoah, the newer design as embodied in the Los Angeles is considered better and safer for future construction.

32. Although it is possible that some lives might have been saved had parachutes been carried and been actually worn by officers and crew at the time of the break-up of the ship, this does not affect or modify the opinion expressed in O14 above, that the use of the present type of parachute in rigid airships is not advisable. The lesser danger must be accepted to avoid the greater risk.

VII. Loss of and damage to property.

Facts.

46. The loss of the Shenandoah was complete. Steps for the recovery of salvage value from the wreck have already been taken.

47. Minor damage was done to private property belonging to three residents in the vicinity of the disaster.

48. A board was appointed by the Secretary of the Navy immediately after the loss of the ship, which was charged with the duty, among others, of making report in regard to damage to private property.

Opinions.

33. The report of the senior member of that board adequately covers the matter of damage to private property, and the recommendations contained therein are sufficient to permit final decision and further action on the claims arising from this source.

VIII. General.

Opinion.

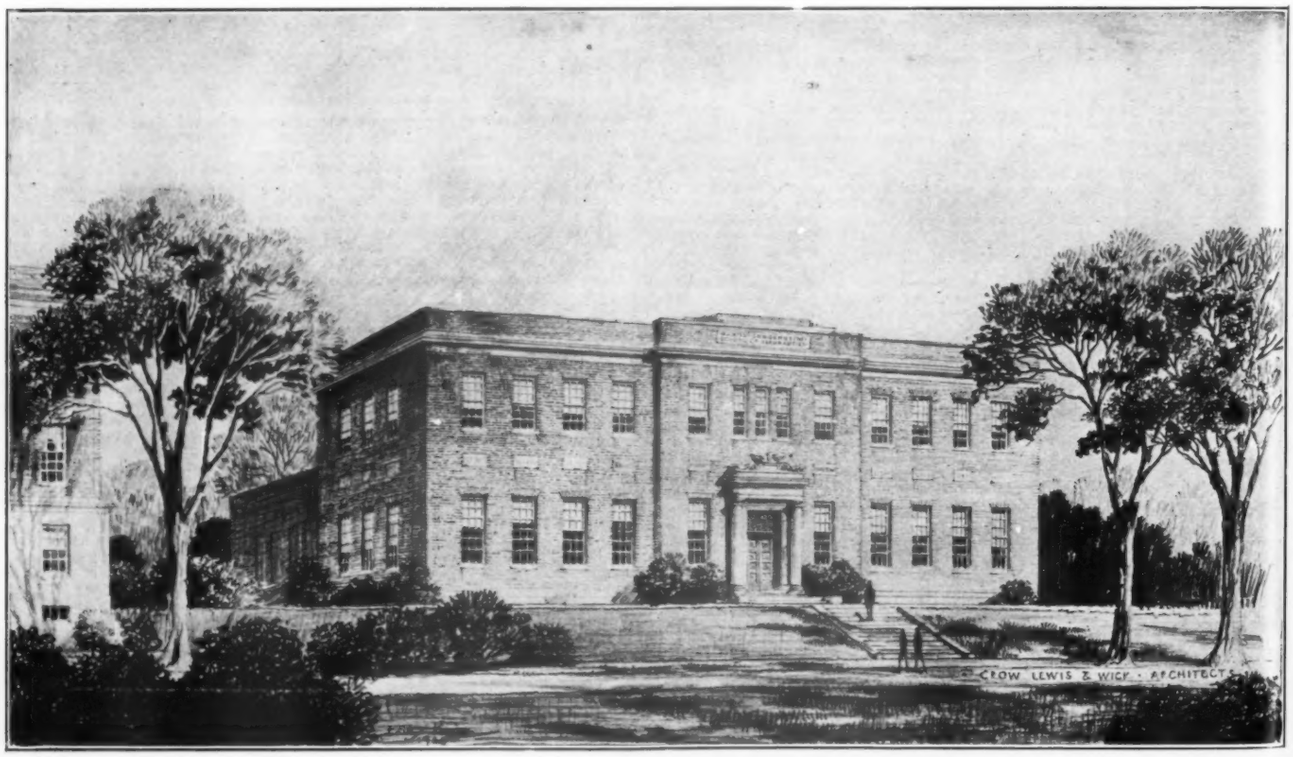
34. It may be accepted in the case of the loss of any craft at a certain place at a certain time that any change of action on the part of any individual directly or indirectly connected with the movement of such craft might have avoided such loss. In this sense, and in this sense only, can allegations of direct or indirect individual responsibility for the loss of the Shenandoah and the loss of life consequent thereon be supported. Such actions of individuals must be judged on the basis of the facts and established practices known and recognized at that time rather than on conclusions or deductions drawn after the event. Such actions of individuals as in light of subsequent events have been termed "errors of judgment," were, in the opinion of this court, clearly without negligence or culpability. The disaster is part of the price which must inevitably be paid in the development of any new and hazardous art.

35. The court is of the opinion that the recommendations of Professor Hovgaard, technical adviser to the Judge Advocate, in his technical analysis of the evidence, and of Lieutenant Commander Rosendahl, senior surviving officer of the Shenandoah, in his summing up of the case on behalf of the survivors, both of which recommendations deal with future development of rigid airships, are worthy of the most careful consideration.

36. The court is of the opinion that competent technical and operating officers should be detailed to study the great mass of evidence and exhibits forming a part of the proceedings of this court in order to collate it in such form as to be most readily available and useful for future reference in any further development in the arts of construction and operation of rigid airships

Recommendation.

That no further proceedings be had in the matter



The proposed building, now under construction, of the Daniel Guggenheim School of Aeronautics at New York University. The School of Aeronautics is under the direction of Prof. Alexander Klemin

McCook Field Review

Many Interesting Designs and New Equipment Developed at McCook Field During the Past Year

By MAJOR JOHN F. CURRY, A.S.
Chief, Engineering Division

That aeronautical engineering development has been advanced in a very marked degree through the activities of the Air Service Engineering Division, is very decidedly brought out in the review of the past year, by Major Curry. The review, which is printed below, represents a very complete discussion of these activities and forcefully characterizes the important work being carried on at McCook Field.—EDITOR.

In reviewing the engineering activities of the Army Air Service conducted at McCook Field, Dayton, Ohio, during the past year, it is evident that a momentous advance has been made in all lines of aircraft development. Whether this advance be in the experimental development of new equipment or in the perfection of that already extant, two things are certain: first, that such progress has been possible through the excellent cooperation given by the American aircraft industry and, second, that the results of the year's efforts have as great a value to commercial aviation as to military aviation.

Experimentation and research, which constitute an important part of the Engineering Division's activities, have been productive of many new and light metals and materials as well as more economical methods of construction, without which greater improvements in design of aircraft and aircraft accessories would have been impossible. In this work the Government has accumulated a vast amount of information.

Airplanes

The predominant trend in military aircraft development has been toward a marked reduction in the number of types required for military use. Formerly fifteen standard types of aircraft were considered necessary properly to fulfill all military functions, but today only five general types are required to accomplish the same purposes. This reduction has been gradually brought about by designing aircraft in certain instances to perform two or more functions through interchangeable equipment, thereby making for simplicity and economy in production and maintenance.

The five general types to which military requirements have been reduced, are as follows: pursuit, bombardment, observation, training, and cargo-carrying or transport. Nearly all special types represent modifications of these types.

For pursuit aviation, an improved type airplane, known as the P1, has been developed by the Curtiss Aeroplane & Motor Company, Inc., of Garden City, L. I., to supersede their earlier PW8 model, previously adopted by the Army Air Service. Although built around the same engine —the Curtiss D12—the new P1 has much greater maneuverablity than its predecessors, incorporating single-bay tapered wings and underslung radiators in place of double-bay straight wings and wing surface radiators used in the preceding type.

Another pursuit type airplane of equal performance is the Boeing PW9 which was placed in production during the year. This airplane is of the tapered wing biplane type, designed and built around the Curtiss D12 engine, by the Boeing Aircraft Company of Seattle, Wash.

Bombing Planes

In the bombardment class unusual interest is centered around the new XLB1, an experimental type light bombing plane developed by the Huff, Daland Company, of Bristol, Penna. This airplane, which weighs over 10,000 pounds with full load, is the largest single-engined airplane of its type ever built in this country. It is powered by one of the new 800 hp. geared type Packard engines, swinging a 16 ft. propeller, and carries a crew of three: a pilot, a bomber, and a gunner—in addition to five machine guns and a normal bomb load equal to that carried by conventional two-engined bombers. By installing larger landing wheels, size 54 x 12 in., the same as used on the Barling Bomber, a 4000 lb. bomb may be carried. Due to its relatively high speed (about 125 m.p.h.) and its greater load-carrying ability, the XLB1 is destined to supersede the conventional multiple engine type bomber in present use. The XLB1 was in an event in the Air Races held at Mitchel Field last October.

Early in the present year, an airplane competition was held by the Army Air Service at McCook Field for the purpose of selecting a new experimental type of two-seater observation airplane. Of the three entries that participated—designated as Curtiss XO1, Douglas XO2, and Wright XO3, after their respective manufacturers—the first was selected. This airplane, the XO1, mounting the new 500 hp. Packard engine, showed remarkably high performance and maneuverability, comparable to a pursuit type. Many advanced ideas were incorporated in its construction, such as the riveted duralumin tube fuselage, weighing only 106 lb. and the detachable welded tube engine section to accommodate either Liberty or Packard engine. The use of duralumin resulted in a great saving in weight to the extent that the complete airplane weighed about 300 lb. less than its nearest competitor. Inasmuch as this type of construction was quite new in military aircraft of this class and required service tests, only a few of these airplanes were ordered.

In a previous competition held at McCook Field in 1924, the Douglas XO2 with Liberty engine, was chosen to succeed the obsolescent DH4 as the new service standard observation airplane. The Douglas Company of Santa Monica, Calif., is working on an order for seventy-five airplanes of this design.

Metal Construction

In all-metal construction, six observation type airplanes, similar to the Douglas O2, are under development by the Thomas-Morse Aircraft Corporation of Ithaca, N. Y., a firm which has specialized in this type of construction. This same firm is also manufacturing some experimental metal wings for use on pursuit and observation type airplanes.

For training purposes, two type of airplanes have been selected and produced: the PT1 for primary training, built by the Consolidated Aircraft Company of Buffalo, N. Y., and the AT1 for advanced training, built by the Huff, Daland & Company, of Bristol, Penna. Both types are tandem seaters mounting either a 150 or 180 hp. Wright engine, having been selected by the Army Air Service Training Board, in service tests of various training type airplanes at Brooks Field, Tex.

To facilitate transportation of personnel or freight, nine transport airplanes have been constructed by the Douglas Company. The C1, as this airplane is designated, is designed around a Liberty engine to carry two pilots (one for relief) in a forward cockpit, and six passengers in an enclosed cabin in the fuselage. In time of war, troops or aircraft engines may be transported.

An Ambulance Airplane

The first airplane in this country, built solely for ambulance purposes, made its appearance this year. This aerial ambulance, Model XA1, was designed by the Engineering Division, in cooperation with the Army Medical Corps, expressly for the transportation of sick or wounded. It accommodates a pilot, a flight surgeon, and two patients, the latter being carried in litters in the fuselage cabin with the surgeon alongside. Medical supplies are also provided for administering first aid during flight. The airplane was built by the Cox-Klemin Aircraft Corporation, Baldwin, L. I., and is designed for service in crash rescue work and for public emergency, should the occasion demand.

The Loening Amphibian, which made its debut last year, has been placed on service test with the completion of several production models. Its adaptability to three elements—air, land, and water—rendered it

U. S. Air Service Photo

One-quarter front view of the Boeing Pursuit PW9 with Curtiss D12 engine

particularly advantageous for use by the Navy Department in the recent McMillan polar expedition and more recently by the International Joint Commission in photographing the United States—Canadian boundary at the Rainy Lake Watershed, near Duluth, Minn. The inverted Liberty engine and retractable chassis constitute two of the main features in the design of this airplane.

Among the new accessories pending adoption on service airplanes, is the Oleo pneumatic shock absorber. This type of shock absorber differs from the conventional wrapped rubber cord type in that the landing shocks are absorbed by the cushioning effect of oil and air contained in telescoping cylinders. Its advantage over the rubber cord type is that it requires practically no maintenance or replacements.

Another new feature on airplanes is the airplane brake for decreasing the distance of roll on the ground after landing. Surprising results have already been obtained with this device, which consists of two lined metal discs, attached to each landing wheel, operated independently by pedals in the pilot's cockpit. In a test, an airplane which ordinarily rolls 980 ft. after landing, was stopped by brakes in 340 ft. It was also found that right and left turns could be negotiated as desired by braking the proper wheel.

Engine Development

That engine development during the past year has made a remarkable advancement toward its ultimate goal of one pound per horsepower is seen in the introduction of two new light weight pursuit type water-cooled engines of 500 hp., the Packard 1A1500 and the Curtiss V1400, by their respective manufacturers. These powerful engines each weigh about 1.4 lb./hp.

The new Curtiss V1400 engine is a logical successor to the famous D12 model which has so many of the world's speed records to its credit. The new engine has lived up to tradition, however, by winning both the Pulitzer and Schneider Cup speed races this year.

The new Packard 1A1500 engine is finding application in both pursuit and observation aviation in the following capacities: as direct drive, geared type, and in inverted operation. The Packard Motor Car Company, of Detroit, Mich., has also developed an 800 hp. geared type engine along the same lines as the smaller model for use in large single-engined airplanes, the same low weight to power ratio being maintained.

Geared Engines

The geared type engine, which permits the use of large slow moving propellers, has found ready application in the late type single-engined bombers and other large airplanes. The necessity for this is due to the increase in operating speed of aircraft engines to a point where engine speed produces a detrimental effect on propeller efficiency. By using the geared engine, propeller speed can be held at its maximum efficiency. This is of vast importance to commercial aviation, since increased propeller efficiency on large transport aircraft is utilized in passenger transportation to increase the rate of climb, and in freight transportation to aid take-off with heavier loads.

Perhaps the most valuable development in power plants for commercial aviation is that of the air-cooled Liberty engine. The success of this development of the Engineering Division has demonstrated the feasibility of air-cooling conventional Vee type aircraft engines. As a result, it is now possible to obtain air-cooled power plants of conventional shape, with consequent saving in the installed weight of this engine of about six tenths (0.6) of a pound per horsepower. For the Liberty engine, this amounts to 240 lb., which represents an additional pay load over a water-cooled power plant of the same horsepower. The air-cooled Liberty is also adapted to operate in the inverted position, thereby retaining all advantages in visibility and maintenance possible with the inverted water-cooled type.

A large air-cooled "X" type engine for military use, is now being developed by the Division. This engine is designed to develop 1200 hp. by means of 24 cylinders, arranged in four banks of six each, forming a letter "X." Although conventional, its installed weight will not exceed two pounds per horsepower. The "X" engine, as well as the air-cooled Liberty, is being manufactured by the Allison Engineering Company, Indianapolis, Ind.

Airships and Balloons

Lighter-than-air activities of the Engineering Division have centered about the erection of the RS1 airship at Scott Field, Ill., and the development of airship handling, mooring, and gas producing equipment.

This airship, the largest semi-rigid ever built in this country, was completed and delivered to the Army Air Service by the Goodyear Tire & Rubber Company, after two years' work. It is designed for the use of helium which at a capacity volume of 720,000 cu. ft., gives a total lift of 41,250 lb., of which 11,220 lb. constitute useful load. It will be propelled by four Liberty engines in two units, each of which drives a 16 ft. propeller through reduction gearings. The high speed and ceiling are estimated at 70 m.p.h. and 10,000 ft. respectively, and the airship is now ready for the initial flight.

Improved accessories for airship and balloon operation include a modified grab-winch and highly mobile balloon winch for maneuvering airships and balloons, a light weight truck compressor for compressing hydrogen or helium for transportation in gas cylinders, a gas cylinder cleaning and painting machine for renovating cylinders used in storing hydrogen gas, and some new leakproof inflation apparatus.

Armament

In wartime, the value of any type of airplane depends very largely upon its suitability as a carrier of offensive and defensive weapons. For instance, a pursuit type virtually becomes a flying gun mount, whose function is to attack enemy airplanes at high altitudes, by maneuvering itself so as to point its guns, which are fixed to fire forward in the line of flight, directly at the enemy. At low altitudes, a pursuit type delivers its attack against enemy ground formations or other objectives by diving upon them. This type of airplane mounts either .30 or .50 caliber machine guns firing forward, between the blades of the propeller. In order that the bullets will not hit or damage the revolving blades, several types of so-called synchronizers, operated mechanically or electrically, have been developed to stop, automatically, the firing of the gun while the blades are passing in front of the muzzles. For ground attack, a pursuit plane carries a 37 mm. aircraft cannon and several small bombs.

Both offensive and defensive armament are carried on two-seater airplanes which are usually adapted for high altitude observation aerial photography or artillery spotting. In this case, flexible guns are placed on a rotating turret mounted on the rear cockpit, where they can be manipulated by a gunner as defensive weapons to protect the rear, above and below or as offensive weapons to supplement the forward fixed guns operated by the pilot. To facilitate handling of the rear guns with greater ease and rapidity, a new turret has been developed which allows the guns to be shifted quickly into position for firing and reduces wind interference to a minimum by the addition of wind compensators.

An innovation in ground straffing airplanes is the mounting of six to ten guns inside the lower wing outboard from the propeller circle. Guns shooting forward from this position require no synchronization with the propeller and may be controlled by either pilot or gunner. An airplane thus equipped becomes a formidable weapon for attacking ground objectives, particularly in surprise attacks, due to its enormous volume of fire. Experiments now underway will enable the operator to shift these guns slightly downward, making it possible to deliver a raking fire upon the ground while the airplane is flying level.

Development of Bomb Sights

Bombing from the air has become a highly effective weapon of destruction through the development of the bomb sight, from the crude guesswork of wartime use, to the present day instruments of extraordinary precision. The great improvement in the accuracy of the modern bomb sight has not only enabled bombing from aircraft to be carried out under weather conditions considered impossible during the late war, but also has produced effective results at ten to twenty thousand feet, which are well above the present actual danger zone of anti-aircraft fire. At 15,000 ft. altitude—or about three miles—the bombing airplane is practically immune from anti-aircraft fire. At 20,000 ft., even a large bombing plane becomes a very indistinct speck in the sky and is practically invisible. Bomb sights have already been perfected by the Engineering Division to give effective results from altitudes as high as 30,000 ft. in the event of bombing planes capable of attaining such altitudes being developed.

Incidently, these new instruments automatically compute the proper sighting angles in an astonishingly short time of observation. It is, therefore, necessary for the bomber to hold a straight course for only a very brief period, in order to get the range. This imposes a serious handicap on the anti-aircraft gunner on the ground in getting an accurate sighting on the airplane. Besides computing the sighting angles, the new instruments also automatically trip the bombs when the proper range distance is reached. This action is coordinated with the releasing

U. S. Air Service Photo

One-quarter front view of the Douglas Observation O2B, production model

U. S. Air Service Photo

One quarter front view of the Curtiss Observation XO1 with Packard 500 hp. engine

mechanisms on the racks, which are so designed that the sighting instrument will automatically trip one or more bombs, in any desired series or combination, or release the entire number at one time, as in "Salvo."

Equipment

Recent advance in the design of night flying equipment has been directed toward the development and standardization of the high power incandescent electric lamp, both as a substitute for the carbon arc in aerial beacons and airdrome floodlights, and as a means of increasing the illuminating efficiency of present airplane landing lights. In this work, the Army Air Service has received excellent cooperation from the Edison and Westinghouse electric companies.

One of the most important steps in this development is the standardization of the 24 inch incandescent revolving beacon for use by the Night Air Mail and night airways services. This beacon has been equipped with a lamp changing mechanism whereby a burnt out lamp is automatically replaced by a spare one, without interrupting the operation of the beacon. At the same time the change in lamps is called to the attention of the watchman by colored light and sound signals so that he can immediately replace the burnt out bulb.

To guide the aviator on his course in foggy and cloudy weather, a radio beacon has been developed. The beacon is virtually a ground radio transmitting station, capable of sending characteristic radio signals for a distance of 250 mi. in any desired direction, the signals being received by the aviator through an ordinary airplane receiving set. In very recent experiments the signals emanating from the beacon have been made visible to the pilot by receiving the signals through a set of colored lights on the airplane instrument board. So long as the airplane maintains its proper course, a yellow light flashes on the board. Any deviations to left or right are made visible to the pilot by the flashing of red or green lights. The radio beacon system as developed by the Engineering Division has been established at Monmouth, Ill., for the use of the Air Mail Service.

Three new instruments—the induction compass, the drift sight, and the flight indicator—are being perfected for course flying through fog and above clouds. A sensitive altimeter has also been developed to aid in aerial photography. This instrument is very sensitive to the slightest changes in altitude, and for this reason all exposures can be made at the same altitude, thus enabling the photographs to be taken at the same scale.

New single and multiple lens cameras, now under development, will, if successful, surpass anything so far attempted. The new single lens camera is designed for high altitude, long range photography. Due to its large size, this camera will be mounted horizontally in the airplane, and the exposures made by means of a prism which can be rotated to take either vertical or oblique photographs. With this camera, pictures can be taken in practically all directions.

A camera with five lens, operating upon the same principles as the famous Air Service T1 (three lens) camera, used so extensively in geological surveys, has also been designed for aerial mapping purposes. This instrument has one vertical and four oblique lens, two of the latter giving a wide angle, making it capable of photographing, at one exposure, eight times as much terrain in the direction of flight, as the T1 camera. Its great advantages lie in giving increased accuracy in aerial mapping by having widely separated control points photographed successively, at different angles, from two sides—a feature that is believed to be the ultimate solution of the problem of obtaining accurate contours.

Projects of Special Interest

A new process, known as "Quick Work Photography," has been developed by the Engineering Division in cooperation with the Eastman Kodak Company, by which it is possible to take, develop, print, and deliver, from an airplane in flight, completely finished photographs within ten minutes after exposure. This feat has been demonstrated at Dayton, Chicago, and Rochester. More recently, at Fort Leavenworth, Kansas, aerial photographs were taken, developed, and dropped from an airplane to a ground station, where they were simultaneously transmitted over telephone wires to New York, San Francisco, and Chicago, within twenty minutes from the time of exposure.

Remarkable results have been recently obtained in taking night aerial photographs by flashlight. In these demonstrations photographs are taken by the flash furnished by a 50 lb. charge of special magnesium flashlight powder, which is towed and exploded at a safe distance behind the airplane or otherwise dropped and exploded from a parachute. Photographs, taken in this manner from an altitude of 3000 ft., show ground objects over an area as large as three square miles, with remarkable clearness. Night aerial flashlight photography is of inestimable value for military purposes, as well as being a great advance in the science of photography.

Through the use of haze filters and hypersensitized films and developers,

U. S. Air Service Photo

Close-up view showing side type supercharger installed on Engineering Division XCO5A altitude plane

it is now possible to obtain satisfactory aerial photographs from altitudes above 30,000 ft. through haze that the eye cannot penetrate. The altitude at which pictures can be taken, may be greatly increased in the near future by the use of a special high altitude airplane with supercharged engine recently completed at McCook Field.

Several photographic surveys have been consummated during the year. Noteworthy among these, are the photographic trips made by McCook Field aviators—one over the Air Mail route from Chicago to San Francisco, taking in several national parks in the vicinity, and the Rainy Lake mapping survey, in cooperation with the U. S. Geological Survey, along the Canadian Border in the vicinity of Duluth, Minn. Other projects, in cooperation with the Department of Agriculture, included the taking of the crop census by making aerial photographs of agricultural regions and the collecting of rust spores on glass slides in the upper atmosphere, to determine the prevalence and direction of propogation of a destructive grain disease known as "Stem Rust."

As to records, the Army Air Service lays claim this year to both the Pulitzer and Schneider Cup trophies. Both contests were won by the same Army-Curtiss R3C racer, the plane being equipped with pontoons for the seaplane contest. The three kilometer record for seaplanes was also established by the same machine at a speed of 245.713 m.p.h.

Aviation Lighting

A General Discussion of the Air Mail Lighting System Now in Use for Night Flying

By H. C. RITCHIE

Aviation Lighting Specialist, General Electric Co.

AT AN AIR MAIL field a few days ago, the Assistant Manager said to me, "You probably have your ideas as to how airways and fields should be lighted for night flying. Why don't you ask the pilots? We have fourteen here and I will guarantee fourteen different opinions from them as to the best method." This being overheard by several of the aforementioned pilots, a discussion started which adjourned to the bunk room and there, for a few hours, I very attentively and quietly listened to arguments that proved to me that the Assistant Manager was wrong; he should have promised at least fifteen opinions from these fourteen pilots.

Nevertheless, it is a fact that these same pilots nightly fly over the air mail route which is marked by rotating beacons, and into fields which are marked by boundary lights and illuminated by floodlights of various powers and designs. The present system of lighting has been developed by interested engineers over a period of years and, while it is true that the pilot has not always been satisfied with the results, at least he has been very successful in carrying on.

Airway Lighting

A description of the lighting system now in use by the air mail, should properly be divided into three parts. Airways, Airports and Airplanes.

The route between New York and Chicago has 50 emergency fields, at each of which is located a 24 in. rotating beacon, using a 900 to 1000 watt incandescent lamp, the beacons being mounted on 50 ft. steel towers. These rotating beacons show the location of the emergency fields and are also used at intermediate points to indicate the route. Power is obtained from either the local power company or a generator driven by a gasoline engine located in a small house in the base of the beacon tower. At intermediate points along the route, where local power is available, cluster beacons are located, consisting of four automobile headlights revolving at approximately 10 r.p.m. In addition, it has been found advisable to install flashing gas beacons in mountain passes where a narrow path must be followed for a short distance.

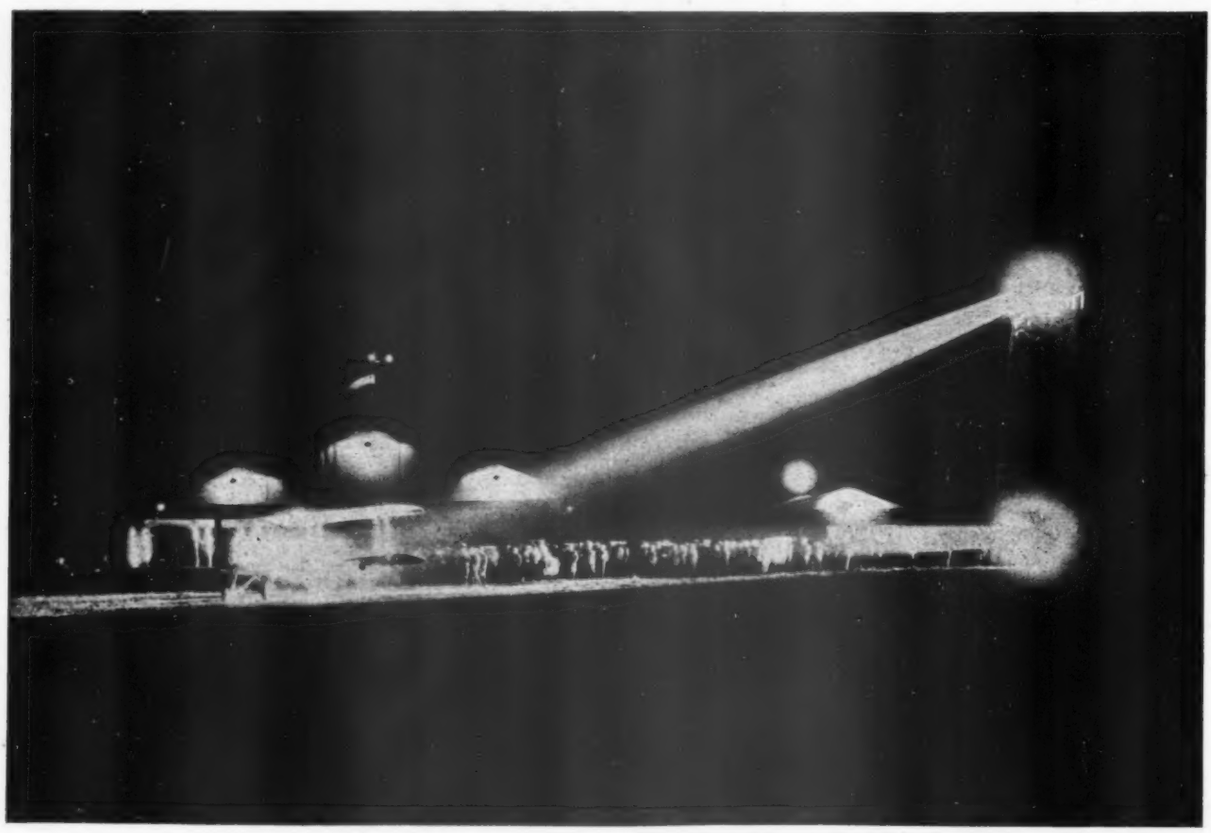
Airport Lighting

At terminals and semi-terminal fields, the outline of the landing space is marked with 60 candlepower boundary lights, operated from a constant current transformer on a series circuit. These are spaced approximately 200 ft. apart and give to the pilot flying at night a pattern of the field. Green lights are placed at points where favorable approaches may be had. All obstructions, such as pole lines, water towers, trees, etc., are marked with red lights, usually wired into the series boundary circuit.

The Air Mail Service lights the landing spaces at the terminal fields by a large floodlight which consists of a 180 degree Fresnel lens 3 ft. 6 in. in diameter and 4 ft. 8 in. high. The light source is a General Electric 150 ampére arc, the mechanism being the same as that used in motion picture studios. This floodlight throws over the field a very clear bluish light of an intensity well above the minimum requirements for landing.

A Smaller Floodlight

A less expensive unit has been developed for the same purpose, in this case consisting of a small Fresnel lens, approximately 6 in. radius and 8 in. high, with a 900 to 1000 watt

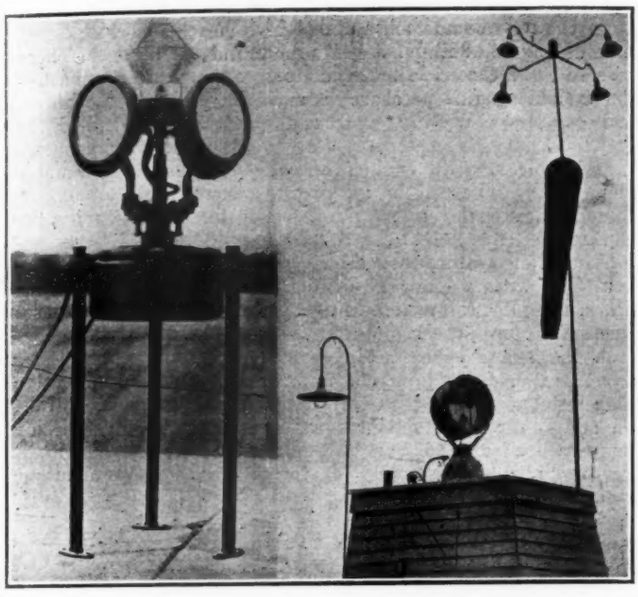


The Air Mail Field at Omaha, Neb., illuminated for night flying

incandescent lamp and a spherical mirror placed back of the lamp to reflect light which would otherwise be lost. These units are mounted on pipe supports, about 300 to 400 ft. apart, on two sides of the field and, in this way, give more uniform illumination than is obtainable with one large unit.

Advantages of Small Units

The other advantages of the smaller unit are: (1) the factor of reliability is greater than with the larger units, as the outage of one light would not materially affect the illumination; (2) in foggy weather the smaller units have the advantage of providing illumination near the borders of the field without the great diffusion from one large unit which may produce a glare and not sufficient illumination on the ground; and (3) the smaller unit gives a better idea of the contours of the field, than does the larger unit, which, from the air, exaggerates the apparent flatness.



Typical lights in use on the night Air Mail route

Airplane Lighting

All the airplanes of the Air Mail Service used on the divisions which fly by night, are provided with two wing tip landing lights. These are small searchlights operated from a storage battery on the plane and properly streamlined to reduce wind resistance. Red, green, and white navigation lights are also provided.

Lighting requirements, of course, will differ with location, amount of traffic and with new ideas and suggestions of the pilots and aeronautical engineers. However, for the present, the fact that the air mail is nightly operating its service with the equipment described above, would indicate that this method of lighting is quite successful.

Removal of Rust Preventive Coatings

AVIATION was recently requested to furnish any available information regarding a solution which would remove from airplane engines, rust preventive coatings, which had been applied by the Air Service on surplus engines placed in storage and later sold to dealers.

An inquiry addressed to the Information Section of the Army Air Service has elicited the following information, which will doubtless prove of interest to airplane engine dealers:

"The Power Plant Section of the Engineering Division has used a solution consisting of equal parts of benzol and denatured alcohol, with very good success. The solution has been found to dissolve, without much difficulty, all the rust preventive coatings encountered at the Engineering Division."

A Matter of Right and Left Hand Throttles

TO THE EDITOR OF AVIATION:

A great many of the present day light commercial airplanes are equipped with the right hand throttle, which, from the Army aviator's point of view is entirely wrong.

It seems that from early aviation history the throttle was placed on the right side with the idea in mind that the pilot must use his right arm to operate a telegraph key in army training, therefore making it necessary to fly with his left hand. That, however, was altered, it being later realized that an observation pilot had an observer to do the signaling and obviously pursuit flyers were not required to telegraph.

Ninety per cent of all people are naturally right-handed—that is, they are more clever and quicker with their right than with their left hand. Of course, by consant use of the right hand strength and skill are developed. What then is the sense of subjecting the weak, untrained left arm to wrestle with the control stick, which, at times, especially in wind storms, is very difficult to handle. And why use the right more developed and strong arm to operate the throttle, which does not require any muscular effort and very little dexterity.

Although the writer has trained himself to fly with either arm, other pilots, may at sometime, find it necessary to pilot an airplane with the throttle placed on the opposite side to which he is accustomed and find it very perplexing. It may even result in a serious accident. It is simple enough, while flying in the air, to control the plane with the untrained hand, but just let a pilot try to land in a tight place with that arm. He can fly cross-armed, which a great many do. But can maximum efficiency, safety and ease of control be obtained in this fashion?

The fact that all modern Army aircraft, and those that are not so modern, have left hand throttles ought to be sufficient proof that this arrangement is preferable.

It is requested that manufacturers of the light commercial airplane give this matter their earnest consideration and suggest that they conform with the practice of so placing the throttle that the majority may use their naturally developed right arm. It would then be easier to change the ten per cent than the ninety per cent.

EDWIN L. PRESTON

A Notable Light Plane Flight

One of the most interesting light airplane flights was made on Dec. 23 from London to Dublin by Colonel the Master of Sempill, a director of the International All Steel Aircraft Syndicate, in a tiny de Haviland Moth two seater. The flying time was 4 hr. 35 min. with one halt. The flight, made despite strong head winds, included a 70 mi. open-sea crossing

The machine, it will be rembered is equipped with a 60 hp. Cirrus engine, which, in many respects resembles an automobile engine, being extremely simple. It can be started from the pilot's seat. It is generally claimed for this plane, which at a maximum speed of 90 m.p.h., that the operating expenses are less than those of a high powered automobile.

Skywriters Have Florida Contract

The American Tobacco Company has placed, with the Skywriting Corp. of America, a contract for advertising Lucky Strike Cigarettes throughout the state of Florida during January and February. It will be recalled that commercial skywriting was introduced in the United States two years ago, with a Lucky Strike advertising campaign, which continued for a year and covered important centers throughout the country.

Night Air Service Planned

An airplane freight express service between London and Paris by night, will be instituted Jan. 15, on the line of the Imperial Airways Limited. If the freight service is successful, a night passenger service will be added. The London-Paris air route is now illuminated at 10 different points, by special ground lights and flashing beacons.

A New Altitude Airplane

The Acute Conditions of High Altitude Flying Involve Special Design Problems

By A. M. JACOBS

THE P-53, Le Pere biplane, twice in tests of altitude equipment taken to heights which secured for the United States world altitude records, having well served its purpose, is about to be retired in favor of a more modern design. Its successor, the XCO5, designed and built by the Engineering Division in 1923, is at present undergoing remodeling with the expectation of being ready for the testing of altitude equipment in the near future. In looking about for a plane which would most efficiently fulfill the conditions for altitude work, several features governed. It had been decided that the new choice must be designed for a supercharger, must be lighter per wing-span ratio than the old Le Pere and adapted to being fitted with high lift wings and a propeller of large diameter. The XCO5, more than any other plane, seemed to answer this description and to more generally lend itself to the modifications which would be necessary.

Wing Design

Of first importance, were the wings. The type selected to give the high lift desired was the Joukowsky StAe-27A. A set of wings to this design was built in the Engineering Division shops. Of wood and fabric construction, they are heavily cambered, being extremely thick at the leading edge and tapering sharply to the rear. Gap and stagger are pronounced. They present a total area of 600 sq. ft., with an aspect ratio of 10. Mounted on the fuselage on the XCO5, they reduce the weight-span ratio to a much lower value than the plane's original wings. With these wings it is planned to use a detachable-blade aluminum alloy propeller, 10 ft. 6 in. in length with pitch adjustable on the ground.

The inside of the fuselage of the plane has also undergone considerable remodeling in preparation for the frigid journeys. The liquid oxygen flasks, in former flights placed in the rear cockpit, have been moved to the rear of the rear cockpit with tubes and regulators carried through to the front cockpit. In the one-man altitude tests, the rear cockpit will carry the recording barographs and thermographs and be sealed over. The pilot's cockpit has been completely lined, the floor and lower half of the walls with plywood, the upper half with quilted felt corduroy which, coming around the back of the pilot's seat, forms a taut cockpit covering which fastens about the pilot's neck and extends to the cowling. Even the opening about the socket of the control stick is closed over with corduroy, the whole interior being made snug against the entrance of outside winds or drafts. Through the cowling, which is of transparent celluloid, the pilot looks down upon the instruments and controls, with each of which, some time during the flight, his eyes or hands must be busy. There he sees the altimeter, the tachometer, the air speed indicator, the variable engine pressure gage, which indicates the difference of air pressure in the carburetor as altitude is gained, the fuel level gage, the fuel pressure gage, the water thermometer for water leaving the engine, the water thermometer for water leaving the radiator, the oil pressure gage, the thermometer for oil entering the engine, the thermometer for oil leaving the engine, the clock, the oxygen flow regulator, the Liberty engine ignition switch, the battery control switch—the plane is equipped with a dual set of batteries so that, if one runs down, the pilot can switch to the second—the emergency gasoline hand pump, the radiator shutter control, the throttle control, the spark control, the carburetor mixure control, the supercharger blast gate control, the gasoline shut-off valve and, last but not least, the airplane stick and rudder controls. In addition, will be mounted a thermometer to give the air temperature inside the cockpit and a second altimeter registering the altitude according to the Federation Aeronautique Internationale reckoning.

Heaters Provided

In former flights, a temperature as low as 82½ degrees below zero, Fahrenheit, had been encountered. To further protect the pilot from the extreme cold, an extra heating apparatus has been mounted on the exhaust manifold on the left side of the plane so that the cold air passing over the hot manifold and becoming heated, is led through a tunnel and thence into a flexible conduit which, extending into the interior of the cockpit, ends near the control stick. In this way, the warm air will be directed to the pilot's hands and the center part of his body, though because the conduit is flexible, he may change that direction as he chooses. Dampers in the tunnel make it possible to keep the temperature from becoming too warm at the lower altitudes, a danger which, of course, will not exist higher up.

The altitude plane, XCO5A, of the Engineering Division, McCook Field. Note the side type supercharger. Lieut. John A. Macready is standing by the plane

The XCO5 is powered with the 400 hp. Liberty engine. A submerged fuel system has been adopted for altitude work; that is, the fuel pump has been placed at a level lower than the gasoline tank, thus accomplishing gravity feed from tank to pump. At high altitudes, the boiling point of fuel is reduced close to its vaporization point. Therefore, any added negative pressure imposed on the fuel by its lifting to the pump, is apt to cause vaporization, in which condition it is impossible to pump it to the engine. By submerging the pump beneath the level of the tanks, the duty of the pump is reduced to merely discharging the fuel, which, backed by an even gravity pressure, more easily retains its normal liquid condition. The regular Liberty starting system has been removed and an 8-volt ignition system installed to lighten the plane for these tests.

The Side Type Supercharger

Since the Liberty engine, which delivers 400 hp. at sea level, has an output of but 50 hp. at 35,000 ft. unsupercharged, a supercharger is a prime requisite of altitude work. The General Electric Form F, 20,000-ft. side type supercharger used in previous tests, with certain modifications, has been installed. The supercharger is an air compressor which keeps the air pressure in the carburetor at sea level pressure at heights where, owing to the natural decrease in the air pressure, the horsepower gradually falls away to but a fraction of its original output. In former supercharger installations, much difficulty was experienced with preignition of the engine. This often became so pronounced that the plane had to be brought to earth. It was suspected that a richer mixture with supercharger at altitude was necessary. This was found to be true but the principal difficulty was the overheating of the mixture due to the heat generated in the supercharger itself. Due to the increase of temperature created by the compression in the supercharger, it was necessary to interpose an intercooler between the supercharger outlet and the carburetor in order to obtain satisfactory engine performance. The intercooler, in the form of a honeycomb radiator, was placed on the side of the airplane. It was also found that, due to poor conductivity of the air at high altitudes, additional radiating surface for engine cooling was required. This, with the correction of mixture, put an end to preignition.

Lieut. John A. Macready, who since 1920 has been the principal exponent of altitude test work in this country, will, no doubt, in the coming trials, take the altitude airplane to its ceiling. What the height of that ceiling will be; whether it will exceed all previous ceilings ever made, carrying man farther into space than he has ever climbed before, remains to be seen. To gain a world's altitude record, a height of approximately 40,000 ft., according to Federation Aeronautique Internationale computing, must be achieved, the international ruling prescribing an increase of 100 meters (328.1 ft.) over the previous record, which would be that at present held by M. Callizo of France, who, on October 10, 1924, reached 39,586.47 ft.

An altitude record, however, is not the prime object of these tests. The development and testing of altitude equipment for military purposes is of the utmost importance. Experiment has brought to light that actual combat will scarcely be waged above 25,000 ft., the mental and physical faculties of man being too subnormal above this height for quick and efficient accomplishment. With the development of accurate bomb sights, bombing can be carried on as high as 30,000 ft., as less energy is demanded for bombing than for the more strenuous operations of pursuit combat. Photographic work may be accomplished, however, as high as 35,000 ft. Pictures of great areas, made at this height near McCook Field and enlarged, have proved to be remarkably clear in detail. Such views over enemy territory would be of untold value for war purposes. The plane would be out of sight and hearing of those on the ground and beyond the range of anti-aircraft gun fire. Hence, it is most important that altitude experimental work about 35,000 ft. levels be most ably pursued.

The Pilot's Clothes

Though much has been accomplished in the refinement of plane and engine for altitude purposes in the last several years aside from improvement of oxygen equipment, little has been done toward enabling man to increase his own ceiling or toward gaining normal efficiency for his body in the altitudes which he has already succeeded in reaching. A seemingly almost insurmountable difficulty lies in the task of making up to the human body for the decrease in air pressure and the limited amount of oxygen his lungs are capable of consuming at such heights. The cold, though a severe drain on the system with the best protection possible, is more easily met. To prepare for it, Lieutenant Macready wears over his uniform, a heavy suit of woolen underwear and over that a thick heavily padded, leather-covered suit of down and feathers. Fur-lined gloves, fleece-lined mocassins over the boots and a leather head mask lined with fur, which, with the oxygen mask, completely covers the face, completes the costume. The goggles are coated on the inside with anti-freezing gelatin supposed to function to 60 degrees below zero. Fahrenheit. The electrically-heated suits are not practical for such flights, for they mean but another system of wires and switches for the aviator to add to his already complicated list of mechanisms and controls and should anything go wrong with the wiring, the suffering from the cold would be too intense to permit of continuation of the experiment, even if it did not, in conjunction with the other adverse conditions, cause unconsciousness.

The scientist, ever eager for extending his knowledge of these regions so near the rim of what we call "space", as well as the military expert, is looking forward with the greatest interest to the results of this series of contemplated tests.

Air Service News Letter

The Cover Picture

One of the most important experiments of recent years, looking to the advancement of photography as a means of revealing enemy secrets in the time of war, was recently carried out with complete success.

On the night of Nov. 20, using a Martin bomber and fifty pounds of flashlight powder, a photograph was taken over Rochester, N. Y., by the Army Air Service with the collaboration of the Eastman Kodak Company and remarkably clear photographs were produced.

The pictures taken from the airplane with seven specially designed aerial cameras and a motion-picture machine, were developed and printed in the Kodak Park laboratories under the direction of Lieut. George W. Goddard, who was in charge of the flight.

Darkness became daylight twice during the night for the brief space of one-fiftieth of a second. The fifty pounds of powder, dropped from the plane at an altitude of 3,000 ft., ignited with a heavy detonation. The picture on the cover of this issue is one of these photographs. It is extremely interesting to note the little streaks of light which were caused by street lights fogging the plates while the camera shutter was open, but before the flashlight powder was ignited. Needless to say the forward motion of the plane caused the streaks.

K.L.M. to Refit Commercial Air Fleet

In AVIATION of Nov. 2, an announcement was made to the effect that the K.L.M. was about to refit its fleet of commercial airliners used over the European Air routes, with the most up-to-date planes, the object being to effect further economies in the costs of operation. The Fokker Aircraft Corp. announces that, like the former equipment used by this air transport company, the new machines will be to Fokker designs also, a fact which AVIATION had previously taken for granted.

New Radial Engine Ready Soon

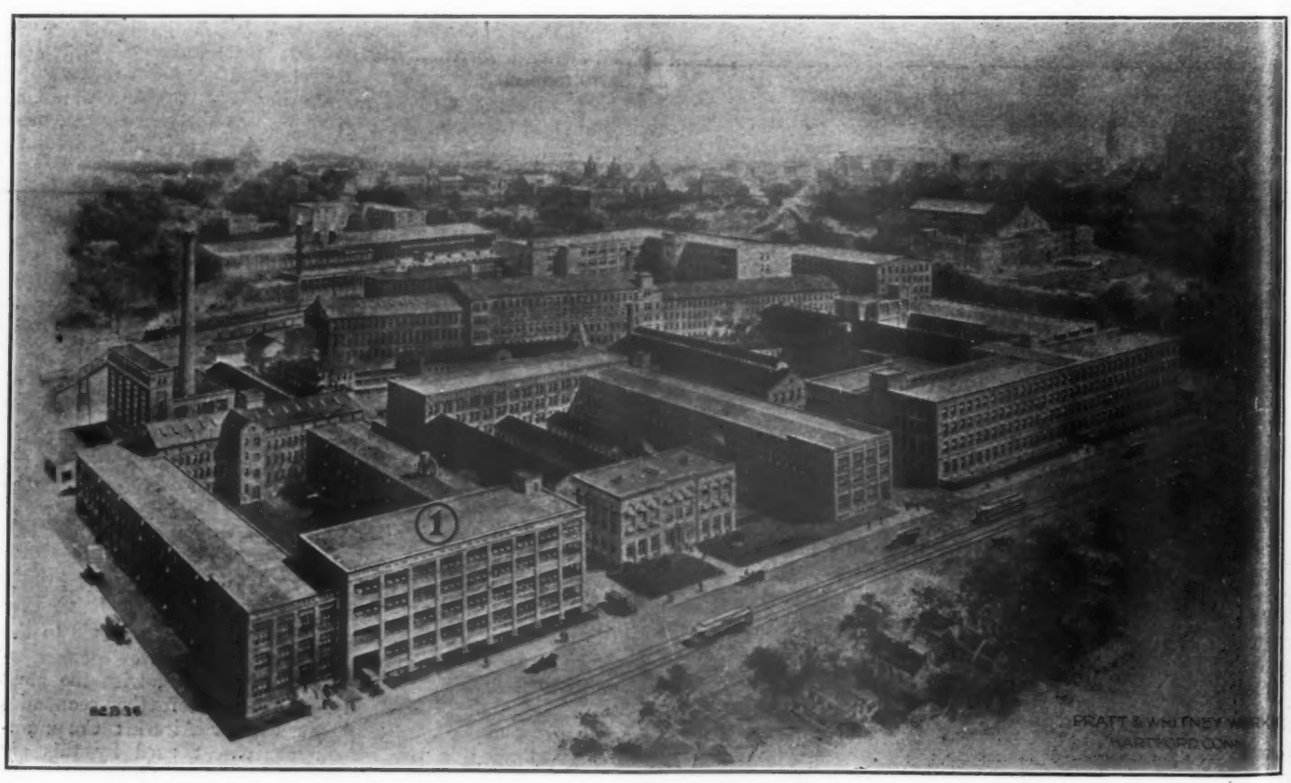
Pratt & Whitney Organization Develops New Design After Five Months Effort

ONE of the most significant aeronautical events of the past year, from the viewpoint of the aircraft industry, was the entry into the field of aeronautical engine construction, of the Pratt & Whitney Aircraft Company of Hartford, Conn. The Aircraft Company is a subsidiary of the Pratt & Whitney Company, also of Hartford, and is under the direction of two men well known in the design and production of aeronautical engines: F. B. Rentschler and George J. Mead. The Pratt & Whitney Company was established in 1860 and, from that period to date, has ranked as one of the most expert and substantial manufacturing organizations in New England. Through its entire history it has maintained this position of leadership in the design and construction of a great variety of precision tools and machinery.

A Firm Background

While the announcement, last August, that Messrs. Rentschler and Mead would organize a new aeronautical engine enterprise, was of great interest, this project seemed to a staff representative of AVIATION, who recently visited Hartford, to be of far greater importance than that of personality and individual ability. One has but to spend a day in the 88 acres of plant of the Pratt & Whitney Company to realize that the entry of this great industrial group into aeronautical development is another step in national defense insurance and is also one of the best indications that aviation is being considered seriously by large industrial concerns. Of course, only a very small part of the entire plant is devoted to aeronautical activities at the present time. However, the buildings equipped with the latest kinds of machinery and other plant equipment, make very apparent, to those who recall the "tooling up" at the beginning of the World War, the enormous benefit which the parent company might be to the Aircraft Company, by affording a manufacturing background, since nearly all of these facilities can be advantageously utilized for airplane engine construction during an emergency.

C. R. Burt
Vice Pres. and Gen. Mgr. Pratt and Whitney Co.



The Pratt and Whitney Aircraft Co.'s plant facilities. Building marked (1) *set apart for aeronautical engine construction*

Impressive as the Pratt & Whitney facilities appear from the standpoint of emergency insurance, it should be remembered that this company in itself is but a subsidiary of a much larger group, the Niles-Bement-Pond Company. This larger group is made up of a number of old and established manufacturing companies, which are among the strongest organizations in the machine tool industry. The value of this background to a company manufacturing aeronautical engines and a proof, in a small way, of the ultimate value to the Army and Navy in the event of a national emergency, is manifested by the fact that our staff correspondent was permitted a view—very fleeting though it was—of a new type of aeronautical engine in the assembly room of the Aircraft Company. Most of the details of this engine were, naturally, withheld. However, its striking appearance indicated something new and unusual in radial engine design. When it is taken into consideration that the Aircraft Company came into existence only last August, and at the end of five months had produced an engine, it will be seen that the unusual facilities afforded by the parent company, have indeed played a tremendous part in this unprecedented accomplishment.

Mr. C. R. Burt, vice-president and general manager of the Pratt & Whitney Company, conducted a party of visitors over a portion of the plant. Mr. Burt has lately become tremendously enthusiastic about aviation. He is one of those who believe that the art has developed to a point where it must be seriously considered by all financial and industrial institutions. Otherwise, and he was very careful to make this plain, neither he nor his company would be engaged in it. "We have not entered the aeronautical field without giving to the subject the same careful consideration and business analysis that we would give to the consideration of any other manufacturing project," Mr. Burt said.

Confidence in Air Transport

Mr. Burt was asked what sort of "business analysis" led his company to engage in aeronautics. "We considered this matter primarily from three points of view," he replied. "First, confidence in aeronautics as a means of transportation, both in war and peace. Second, the opportunity of Pratt & Whitney to obtain personnel of ranking and proven experience in the field of aeronautical engine design and production; and, third, our belief that the resources of the Pratt & Whitney and associated companies together with their long experience in the manufacturing of precision equipment, fits them admirably for this task. Events of the past year, both in increase in the governmental interest in aircraft and the great strides that have been made toward commercial air transportation have lead us to the conclusion that the field is worthy of the most intensive cultivation."

It is expected that before long an announcement and detailed description of the new type of engine will be ready for publication.

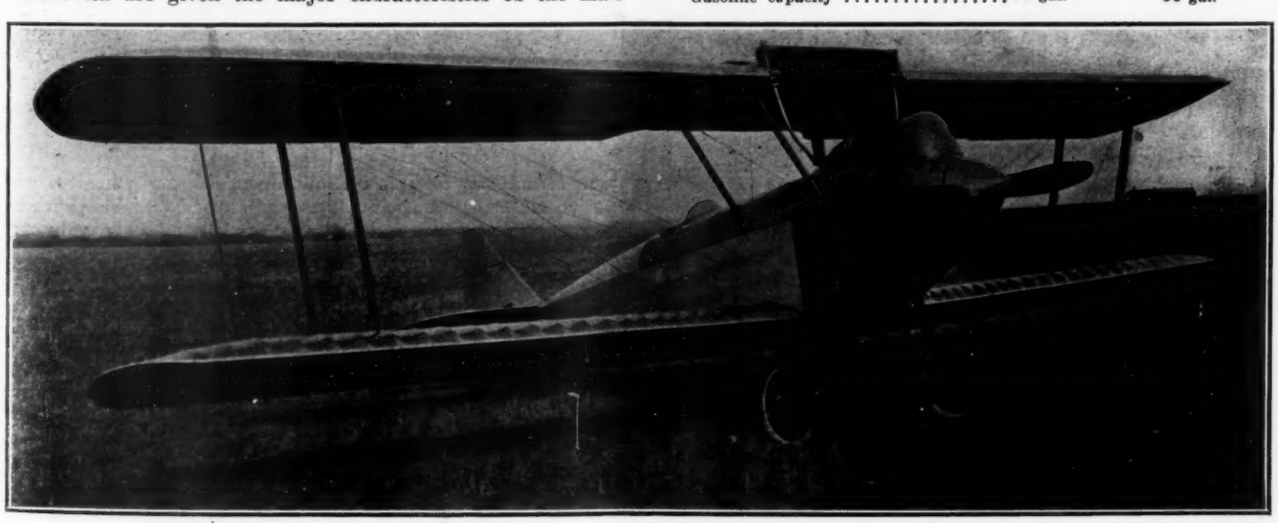
The New Swallow Mail Plane

FOR service on the Elko, Nev.-Pasco, Wash. contract air mail route, to be operated by Walter T. Varney of San Francisco, Swallow mail planes have been purchased from the Swallow Airplane Manufacturing Company. The new mail plane is a modification of the successful New Swallow, with the forward cockpit covered in and formed into a mail compartment, which is reached from the top by means of hinged cover on the left hand side. Other modifications include the fitting of the radiator directly in front of the center section rather than under the nose, between the undercarriage, as in the standard design. Furthermore, tanks are fitted into the center section of the mail plane.

The changing of the engine installation from the OX5 or the OXX6 to the Curtiss K6 has necessitated a change in the shape of the engine cowling, since the latter engine is a straight line six, while the former engines are V eight types.

Herewith are given the major characteristics of the mail plane with the dimensions of the standard New Swallow for comparison.

DIMENSION	MAIL PLANE	STANDARD PLANE
Length	24 ft.	24 ft.
Height	8 ft. 8 in.	8 ft. 6 in.
Span, top wing	36 ft.	32 ft.
Span, lower wing	34 ft.	32 ft.
Chord, both wings	5 ft.	5 ft.
Airfoil section	Aeromarine 6 mod.	
Angle of incidence, both wings	2.5 deg.	
Dihedral, top wing	0.5 deg.	
Dihedral, lower wing	3.5 deg.	
Wing area	350 sq. ft.	300 sq. ft.
Area of ailerons	42 sq. ft.	34.8 sq. ft.
Area of elevator	16.6 sq. ft.	16.6 sq. ft.
Area of complete stabilizer	21 sq. ft.	21 sq. ft.
Area of rudder	6.8 sq. ft.	6.2 sq. ft.
Area of fin	3 0 sq. ft.	13.5 sq. ft.
Weight with water	1,500 lb.	1,300 lb.
Useful load	1,200 lb.	900 lb.
Total weight	2,700 lb.	2,200 lb.
Wing loading	7.7 lb./sq. ft.	7.3 lb./sq. ft.
Maximum speed	118 m.p.h.	95 m.p.h.
Landing speed	20 m.p.h.	25 m.p.h.
Endurance at full throttle	5 hr.	4 hr.
Distance run for take off with full load	150 ft.	500 ft.
Gasoline capacity	56 gal.	36 gal.



The New Swallow air mail plane of the type to be used by Walter T. Varney on the Elko, Nev.—Pasco, Wash., air mail route.

The Location of Terminal Landing Fields

By CHARLES McH. POND

With the continued increases in the use of air transportation, any question relating to the most advantageous locations for the airports which are continually growing up in and around all large cities, becomes of considerable significance. While it is generally held that the nearer in toward the central district of any metropolis, the more valuable will be the airport to the business community of that city, owing to the time saved in reaching the flying field, the following note, which argues in the diametrically opposite direction, raises some interesting points.—ED.

AS COMMERCIAL air lines commence to branch out in all directions linking up the major industrial centers and business cities of the entire country, questions as to what policy we should follow in constructing airports and terminal facilities become paramount. There are a great many questions that must be compromised and decided in order to lay down a comprehensive policy with a view to economical operation. Questions on the size of airports, their locations with regard to land value and probable future encroachments and also the local atmospheric conditions, must be considered.

How far should an airport be from the city and the center of population it serves? The popular idea in this regard seems to be that the closer in, the more advantageous, on account of the time saved. But whether this is a fact, is a question which must be decided.

Suppose there are two cities, which, for the sake of argument, are 1000 miles air distance apart. It is proposed to develop terminals as close in as possible and link these two cities by airline. An available site is chosen which is, for example, 3000 ft by 3000 ft. and located in a rapidly growing district, 30 minutes from town by car.

On account of the small dimensions of the field and the hazardous obstructions in the vicinity, the airplane must be capable of getting out with a very steep gradient of climb. Assuming that after clearing field, the speed is 80 m.p.h. and the engine turns 1400 r.p.m., and that the fuel consumption is 300 lb. p. h. at this speed, the time required to run the 1000 miles, omitting time out for stops en route, is $\frac{1000}{80} =$ 12.5 hr. Adding one hour for time lost between the business center and the point of embarkation, the total time is 13.5 hr. Then, the weight of the fuel consumed is 12.5 x 300=3750 lb.

The engine revolutions are $1400 \times \frac{60}{80} = 1050$ per mile.

The site we have just considered represents, it should be remembered, a very large capital investment, depending on how close in it is situated. For the same charge it would be possible to secure a tract of land, twenty miles out of town, ten times the area, or 9500 ft. by 9500 ft. in dimensions. An airport of this extent will permit us to operate a class of airplane having very different characteristics in regard to gradient of climb and speed.

Assuming the load to be transported is the same as before; using the same engines and running them at 1400 r.p.m., thus keeping the power the same as previously, the problem is to make up the time lost in transportation between the city and the point of embarkation,—the flying field.

Having a clear run of 9500 ft. ahead and practically no obstructions beyond, the thrust of the propeller, while getting under way, is of little importance. This being the case, the design of the propeller may be such as to deliver maximum thrust with high efficiency at the highest air speed. With wings set at zero incidence, and with other refinements incorporated by reason of the large sacrifice made in climbing performance, the airplane will be fast in full flight.

Suppose the speed is 110 m.p.h., with engines turning 1400 r.p.m. The time required to fly 1000 miles is $\frac{1000}{110} = 9$ hr.

Then the weight of the fuel consumed will be 9 x 300 = 2700 lb., a saving of 1050 lb.

The engine revlutions will be $1400 \times \frac{60}{110} = 763$ per mile; a saving of 287 turns per mile adding two hours for the time lost to and from the point of embarkation, brings the total time en route to 11 hr.; an actual gain of 2½ hr. Such an airplane would pick up headway very slowly; a characteristic that is recognized in marine practice as being common to all vessels in which fuel economy is the first consideration. Allowances are made for this propeller deficiency in providing suitable port accommodations for the safe handling of such vessels.

A ship owner is not so very much interested in the rate at which his ships gather headway, as he is in the engine revolutions per mile and the economical performance after clearing port. The history of marine transportation shows a constant improvement in port facilities to meet the requirements of the ships that use them. The ship designers and marine engineers have led the way, and the harbor engineers have followed.

Whether we ship merchandise by sea or by air, the principles are much the same. The problems of port and terminal facilities are similar. The ship owner and the consignee desire port facilities to accommodate the most economical ship that the marine engineers can give him. The final consignee, namely, the public, is the one to be provided with an economic transportation service.

It should be pointed out, that, while Mr. Pond advocates a flying field, located at some distance from the business center, as tending toward economic operation, and bears out his contention with a simple argument, it would seem that he is somewhat begging the question, since the trend of progress should be, rather, in the direction of the design of more efficient airplanes capable of combining the good qualities of a rapid rate of climb together with a high level cruising speed, instead of accepting present deficiencies in design and attacking the problem from the opposite end.—ED.

Wind Pressure on Structures

In structures, such as tall buildings, chimneys, bridges, and power transmission lines, it is necessary to make provision for the stresses imposed by wind pressure. The values of wind pressures now used by engineers, are based on the results of experiments made at a time when experimental methods were in the early stages of development. The models used in the tests were, mainly, thin flat plates—forms rarely used for structures. There is great need for data on models resembling actual structures more closely. The Bureau of Standards completed, during the past year, an investigation of the distribution of wind pressure over a model of a tall building, with the wind striking the face of the building at various angles. The measurements were made in the 10-foot wind tunnel, on a model 8 in. by 8 in. by 24 in., at speeds up to 70 m.p.h. The results will be publishhed as a scientific paper of the bureau. Measurements on a model chimney 8 in. in diameter and 5 ft. high are also nearly completed.

AIR TRANSPORTATION

France Leads World in Development of Commercial Air Transportation

According to a report received by the Transportation Division of the Department of Commerce, a recent survey of French commercial air lines for the five year period, 1920 to 1925, shows that France leads all nations in the development of commercial air transportation, although the number of companies has steadily decreased. After increasing from 12 in 1921 to 17 in 1922, the number of lines has decreased to 9 in 1924, showing a tendency to abandon unsuccessful routes and concentrate on the development of the long important services with an increase in the efficiency of the companies.

This increase in the efficiency of the companies is noteworthy, as, with the same number of pilots—90—in 1924 as in 1921, and 15 less planes, the lines carried 16,729 passengers, 1,934,756 lb. of express and 1,174,571 lb. of mail and flew 2,266,649 miles in 1924, as compared with 10,619 passengers, 577,368 lb. of express and 76,819 lb. of mail, flying 1,460,219 miles in 1921.

With reference to the air mail traffic, it is worthy of mention that, with one exception—the Latécoere Company operating between France and North Africa—the mail traffic cared for by the French companies, is practically negligible. The Latécoere Company in 1924 carried 1,157,254 lb., or 98½ per cent of the total of 1,157,254 handled by all French lines.

Probably the greatest deterrent to the more rapid development of air traffic, as in other countries, is the fear of accident and lack of confidence of the traveling public in the safety of airplanes as a means of travel. The reduction in the number of lives lost on regularly scheduled flights of French lines, from 14 in 1920 in 528,164 miles of flying to 6 in 1924 in 2,266,649 miles of flying, or one fatality in each 377,774 miles flown, as compared with one fatality in each 37,726 miles in 1920, indicates satisfactory progress in the direction of safety and reliability.

All airdromes and landing fields in France used by commercial aviation companies, are owned and maintained by the French government. The companies pay for the accommodation and services rendered. The French Government heavily subsidizes the commercial air transportation companies and it is said that they are the most complicated and liberal of any in Europe. The appropriations included in the French budget of 1924 and 1925 for civil aviation, were, for the fiscal year Jan. 1 to Dec. 31, 1924, 138,463,350 francs; and for 1925, 152,581,700 francs.

In addition to the furnishing of cash subsidies and the provision of landing fields, the Government controls the licensing of pilots and planes and furnishes wireless and meteorological service, aids in the planning of new routes, and conducts experiments in night flying, etc.

Deruluft

The Russian-German Air Line recently celebrated its "million km. day." A million kilometers had been covered in strictly commercial air transportation, on the Berlin-Moscow route. The operations of the Deruluft Company may be taken as a fair example of commercial air traffic, with daily scheduled departures and arrivals, carrying passengers, freight and mail. Single engined Fokker and Dornier planes are used, but the three-engined machines will operate next year.

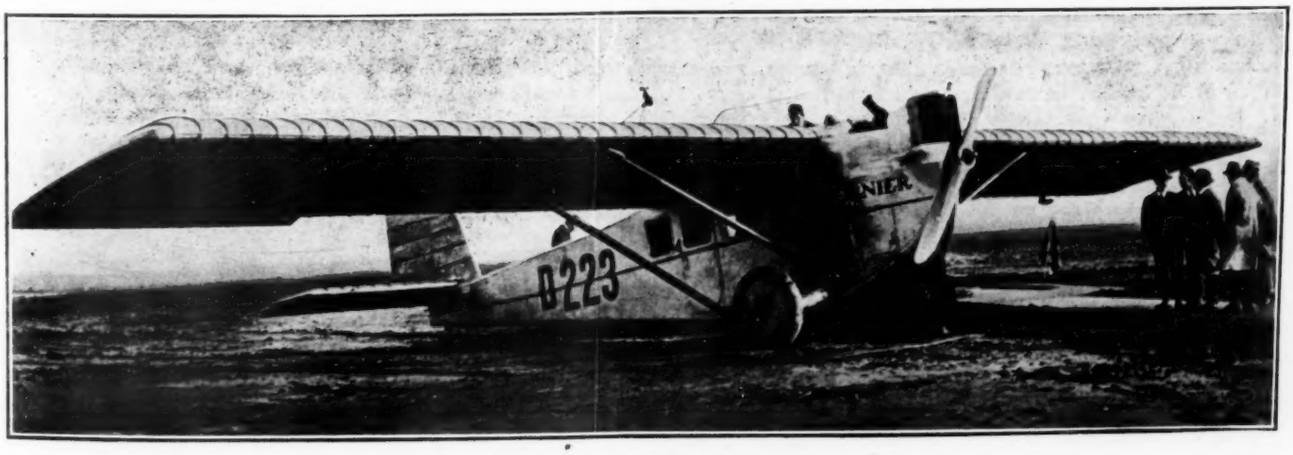
The following are May-June statistics covering four years of operation.

	1922	*1923*	*1924*	*1925*
Kms. (not including trials, etc.)	60,350	94,700	94,700	236,300
Freight, kgs.	7,900	9,650	15,000	25,600
Passengers	165	187	214	581
Flights completed	35	75	120	222

One of the most interesting facts is the fine schedule record established for this long trip of over a thousand miles. The percentage of completed flights to the total number of flights undertaken was 95 per cent in 1923, 99 per cent in 1924 and 98 per cent in 1925. The May-July figures are given on the grounds that heaviest traffic is then carried on. The completed flight percentage, however, falls down to approximately 91 per cent for the entire year's traffic, in each case.

Aviation in the Locarno Treaty

It is interesting to note that, at the conclusion of the ceremony which marked the signing of the Locarno Treaty in London on Dec. 1, the question of aviation found a place in the important proceedings. It is reported that during the afternoon following the meeting at which representatives of seven European countries affixed their signatures to this significant peace pact, Premier Briand, of France, and Chancellor Luther and Foreign Minister Stresemann, of Germany, met in secret conference to consider certain requests which Germany wished to put forward in view of the Treaty, and it is noteworthy that, while the proceedings were veiled in much secrecy, one of the principal German requests was for an extension of Germany's rights in the field of civil aviation.



The Dornier "Komet" airliner of the type used by the Deruluft

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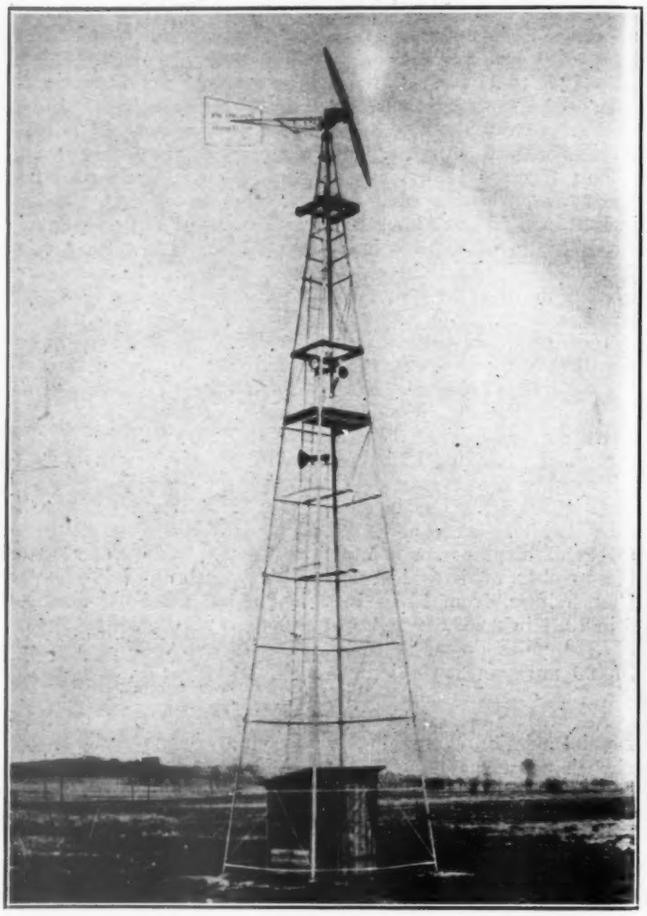
The installation needs only periodic maintenance attention and has proved in every way to be most reliable. The "Aerolectric" was designed in 1919 and went through a two year test. The wind power installation has but four moving parts, all running in oil. Power is, of course, provided by the wind,



The Aerolectric Wind Tower

The "Aerolectric" wind tower which, in effect, takes electricity from the air. The tower is installed at Crook Field, Neb., on the Air Mail route

and whenever this blows at more than 6 m.p.h., the generator, mounted on top of the tower, begins charging the storage batteries housed in the small hut, where the switch board is also installed. The switch board carries the switches necessary to control the various lights and, in addition, two meters, one showing the amount of electricity being generated and the other, the amount used. The application of this equipment to airways purposes is being investigated by the Aircraft Development Corporation, which company holds the agency for all aviation applications thereof.

United States Civil Service Examination

The United States Civil Service Commission announces open competitive examinations for the positions of, Junior Aeronautical Laboratory Draftsman, $1,320; Aeronautical Laboratory Draftsman, $1,680; Principal Aeronautical Laboratory Draftsman, $2,100.

Receipt of applications for these positions will close February 9. The examinations are to fill vacancies under the National Advisory Committee for Aeronautics, for duty at Langley Field, Va., and in positions requiring similar qualifications.

The entrance salaries for the departmental service at Washington, D.C., are shown above. After the probational period of six months required by the civil service act and rules, advancement in pay may be made without change in assignment up to $1,680 a year for junior aeronautical laboratory draftsman, up to $2,040 a year for aeronautical laboratory draftsman, and up to $2,700 a year for principal aeronautical laboratory draftsman. For the Field Service the range in salary will be approximately the same, but the entrance salary need not necessarily be at the minimum rate for the grade. Promotion from grade to grade and to higher grades may be made in accordance with the civil service rules as vacancies occur.

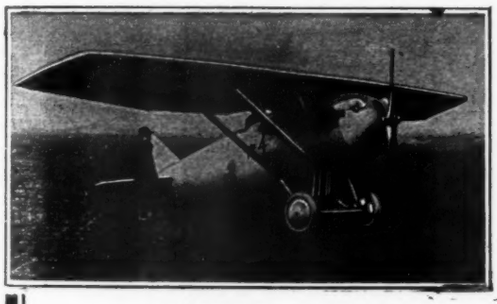
The duties of these positions involve the designing and drawing of mechanical appliances for instruments (usually of small size, and without rapidly moving parts) and their details used in the conduct of the laboratory of the Research Committee.

Competitors will be rated on their education, experience, and fitness; and specimens of drawing and lettering, to be filed with the application. Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D.C., or the secretary of the board of U.S. civil-service examiners at the postoffice or customhouse in any city.

The Vincent OX Plane

A very interesting little three-place airplane, designed around an OX5 engine, is the Vincent, built by its owner, Mr. Guy O. Vincent of Zanesville, Ohio. As will be seen from the photograph, the plane is a neat conventional design, with a well streamlined fuselage and staggered wings. Steel tubing is used very largely in the construction, the fuselage being formed of welded seamless steel tube, as is also the complete tail unit. The wings are of normal construction with no center section and with ailerons fitted to the upper

The Vincent OX plane. In the lower section of the picture the undercarriage is shown in detail.



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wings. Interplane bracing struts are streamline steel tubes.

The simplicity of the landing gear will be noticed and the split-axle type should render the plane very serviceable in almost any field. The tail skid is very simply constructed out of spring steel. The engine is mounted in a normal manner with an underslung radiator and a 2½ gal. supply tank in the upper wing. The control is extremely simple and the wires are hidden as far as possible, all tail wires going direct to the rear, inside fuselage.

Characteristics of the Vincent OX Plane

The general characteristics are in outline, said to be as follows:

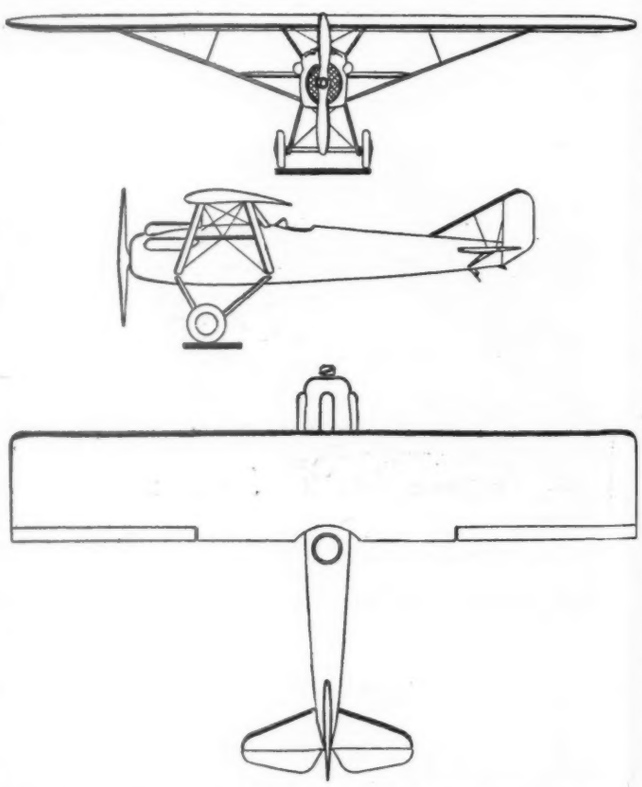
Wing span	29 ft. 0 in.
Overall length	18 ft. 0 in.
Capacity of fuel tank	72 gal.
Top speed	95 m.p.h.
Landing speed	25 m.p.h.

The plane has been used extensively for passenger carrying and Mr. Vincent has toured a considerable portion of the north-eastern part of the country in it.

Gourdou-Leseurre Pursuit Plane

The two French aeronautical engineers, Gourdou and Lesseurre, have specialized on the design of pursuit types of airplanes since they built their first plane in 1918. Their latest product, the 33C1, is fitted with a 450 hp. Lorraine-Dietrich engine. The general conception of the design is so different from the American practice in pursuit planes, that it should be of considerable interest in this country.

The Gourdou-Lesseurre is a parasol monoplane, the wing being constructed in a single unit and having neither taper in plan form nor variation in section thickness. Furthermore, it has neither dihedral nor sweep back. The wing is absolute-



ly rectangular in plan form, except for the absence of sharp corners at the outer extremities of the leading edge and the cutting away of the center section at the trailing edge, to allow the pilot better vision. The wing is of the semi-thick type and the ailerons are unbalanced, long and of exceedingly narrow chord.

The attachment of the wing to the fuselage is simple but would seem to offer a considerable amount of parasite resistance, even when in comparison with a biplane. The entire wing is supported upon four pairs of struts, two pairs

Continued on page 62

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PART II
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each side of the fuselage. The inner struts support the center section of the wing from the top fuselage longerons, while two long metal struts on each side, extend to the main wing spars from points on the lower fuselage longerons. Their attachment with the fuselage longerons is at points corresponding with the undercarriage attachments, while these bracing struts support the wing spars at positions approximately one third of the semi-span from the wing tips. This leaves only a small unbraced overhang but the struts are of such length that they need to be braced by cross struts running up to the wing. The main structure of the wing is of metal but the ribs are of wood, while a fabric covering is used. The structure of the fuselage is of metal, the forward part being sheathed with light metal plate.

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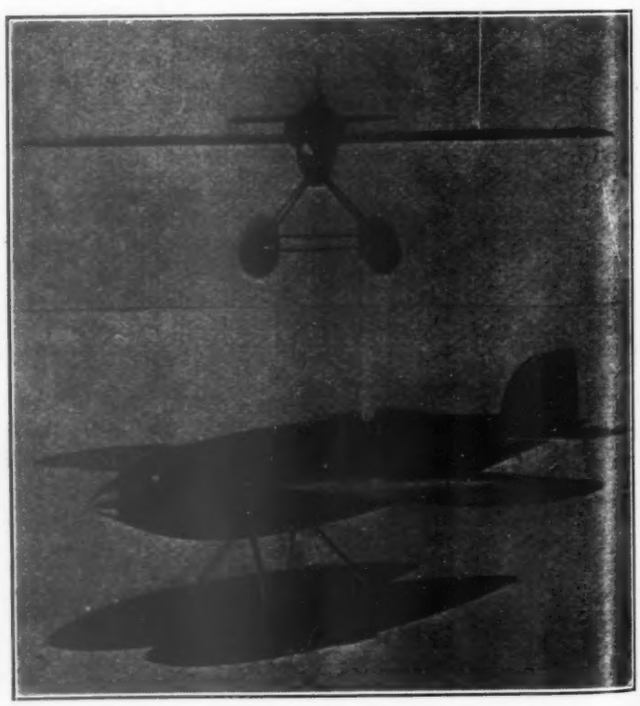
A special effort has been made to make the instruments in the cockpit easily visible. The seats are adjustable and fitted for either a seat type or a back type parachute. The tail is of thin section and braced by external cables. Two machine guns are fitted, firing through the propeller disc, and two more are set in the wing, all being arranged in such a manner that they can be easily reloaded.

General Characteristics

The general dimensions and performance of the plane are as follows:

Span	40 ft.
Chord	6 ft. 6 in.
Length	22 ft. 4 in.
Area	269 sq. ft.
Weight empty	2,505 lb.
Fuel	536 lb.
Useful load	364 lb.
Weight per sq. ft.	12.4 lb.
Weight per hp.	7.5 lb.
Safety factor	11
PERFORMANCE	
Speed at ground level	156 m.p.h.
Speed at 16,000 ft.	150 m.p.h.
Climb in 3 min. 5 sec.	6,560 ft.
Climb in 30 min.	23,000 ft.
Ceiling	27,800 ft.
Landing speed	56 m.p.h.
Take off	260 ft.
Landing	350 ft.

A German Schneider Cup Design



The photographs show a wind tunnel model of a seaplane designed for the Schneider Cup Contest in 1924, by Dr. Dornier. As a result of a wind tunnel test made on the model, it would seem that the plane, if built, would have set up keen competition in the recent contest at Baltimore

AIRPORTS AND AIRWAYS

Chicago, Ill.

By Terence Vincent

Harry T. Sanger, a prominent member of the Kiwanis Club of Chicago, for six months has been operating an airplane department in "Sanger Tours". For the past 17 years he has been operating from the same address (17 North LaSalle St., Chicago) arranging trips over most of the water and land of this world. Last spring he took a "flier" and entered the airplane game. At present Sanger Tours has found the field pleasant, profitable and promising.

"Two men called us from a loop hotel one Saturday about noon, and asked us if our airplane service could get them into South Bend, Indiana, in time for the famous Notre Dame-Northwestern University football game," he said. "And 90 minutes from the time they left the hotel (LaSalle), they were in South Bend. Another party of three wanted to see the Indianapolis auto races on Decoration Day. They took off at about 8 a. m. and were back at 6:40 p. m."

* * *

Cross-country flying is as comfortable in a U.S. Mail plane, as riding in an automobile or a railroad train, according to Pilot Art Smith, who wings his way regularly between Chicago and Cleveland as an aerial Santa Claus.

His trips are day or night, summer or winter. The freezing fog is most likely to keep the airmail pilots grounded; and if clouds are under 800 ft. from the ground, none is permitted to start.

Aside from the regular flying togs—helmet, furlined suit, galoshes or moccasins, and goggles—winter pilots may also have a chamois skin helmet under the regular headpiece, with only holes for eyes and nose. Some of the pilots also carry snow shoes, especially over the mountainous portions of the air mail route. Some planes are equipped with skiis, so that they may alight on snow or ice.

The hot air heater is a furnace-like attachment of value to winter pilots. It was developed at the Maywood field and consists of a sheet-steel sleeve over the right bank of Liberty engine cylinders. A two-inch pipe runs along the right side of the fuselage to the pilot's cockpit and thence connects with a flexible fireproof hose. At the joint is a damper, by which the pilot can control the amount of heat coming into the cockpit. Art Smith says the Liberty engine develops enough heat, while doing its work as powerplant, to heat an average house, complete.

Should any particular part of the pilot become too cold in flight, he can turn the hose of heat on that part and become comfortable again. Pilot Smith sometimes uses a cloth windshield over the cockpit, with just his head outside; a slit in the cloth enables him to read the instruments by the interior electric light.

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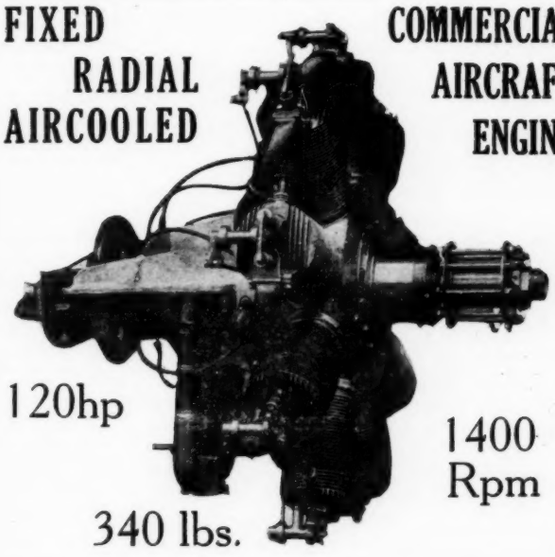

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New England News

By Porter Adams

On December 17, the State of Main Chapter of the National Aeronautic Association, at Augusta, met in the office of Mr. W. H. Gannett, Governor of the Association for the State of Maine, to commemorate the twenty-second anniversary of the first flight by the Wright Brothers. This date was also the anniversary of the formation of the State of Maine Chapter of the Association which now has more than fifty members who are doing a great deal to aid aviation locally, as well as throughout the country. At this meeting, plans were prepared for an active winter in aeronautical matters in Maine and it was announced that a drive for membership for the local chapter would take place in the very near future.

• • • •

T. M. Williams of the Columbus Flying Club, Columbus, Ga., is trying to win "Cy" away from us. Williams wrote us today and asked us to call "Cy's" attention to the fact that besides having a good flying field and lots of Modocks who need a Caldwell education, Columbus can boast of the best peaches in the State of Georgia and Williams is willing to bet that if "Cy" ever got a sample of these peaches he would lose his appetite for our rhubarb pie. This is just to pass the word on to "Cy", but we warn him here and now that the next move is up to him and he proceeds at his own risk.

• • • •

Last week Lieut. Reginald D. Thomas, Commanding Officer of the Naval Reserve Air Station at Squantum, Mass., completed his 700th hour in the air in the space of a single year. This is believed to be a world's record for any one man and was considered of such importance that some of the New York papers sent a reporter and a cameraman clear up to Boston to cover the story. The flying time of Lieut. Thomas by months during the year is as follows:

January	8 hr. 20 min.
February	8 hr. 45 min.
March	12 hr. 13 min.
April	20 hr. 33 min.
May	86 hr. 58 min.
June	115 hr. 35 min.
July	117 hr. 13 min.
Aug.	90 hr. 23 min.
Sept.	100 hr. 48 min.
Oct.	56 hr. 15 min.
Nov.	45 hr. 31 min.
Dec. (to the date of record)	20 hr. 28 min.

totalling 700 hours, 30 minutes for the year. In addition to his wonderful flying record, Lieut. Thomas found time to be active in aeronautical matters in the vicinity of Boston and has initiated a large number of people into the flying fraternity.

• • • •

Lieut. Frederick H. Becker, formerly chief test pilot for the Navy and now pilot for the Wright Aeronautical Corporation, who brought the Wright-Bellanca up to Boston for the Aviation Show a few weeks ago, made an unexpected party call to Mass. last Friday. It was as unexpected on the part of Becker himself, as it was to the people of Massachusetts, when he suddenly landed just a few minutes before darkness in a pasture at Kingston, Mass., near Plymouth. Becker was making altitude trials at Mitchel Field with a new Wright-Apache and climbed to 20,000 ft. in 70 minutes. After completing the trial, he came down and found himself over the sea and in the distance could barely make out land, which he did not recognize as Marthas Vineyard. He came in and made for the first available field because of the few minutes light which were left to him, and after landing made his plane fast to a tree and spent the night at a farm house. The next morning he discovered that his face was so badly frozen and so swollen that he could not see out of his eyes, so he was taken to the Jordan Hospital at Plymouth, Mass., where it is reported that he is doing well and is expected to be released within a few days.

• • • •

Staff Sergeant George E. Schmidt, who until last summer, had been continually at the Boston Airport from the day of its opening, has now returned to Boston much to the delight of everyone who knows him. Sergeant Schmidt, who holds a commission in the Reserve, has been taking flying instruction at Texas during the summer.

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Activity is reported from the field at Weston, Mass., where Lieut. E. D. Beck and his crew are getting ready for the flying activity in the spring. There is a new JN in commission and also an Oriole with Sikorsky wings and a number of JN's are in storage in the hangar and are being refitted with new wing covers for next year.

• • • • •

Cold weather, or the fact that he is a newly married man, seems not to dim the ardor that Dan Rochford, Aviation Editor of the Boston Transcript, has for flying. He flew with Thomas at Squantum, on the very cold day when Thomas made his 700th hour in the air and again at Weston the other day with Lieutenant Beck. Also Dan and his bride recently made flights together in the Travel-Air from the Boston Airport and also in the big Wright-Bellanca while it was up for the Aviation show.

• • • • •

We are writing these notes before Christmas but we don't expect they will be published in time so we can only say that we hope everybody had a very merry Christmas and that aviation in New England, as well as throughout the country, has entered the biggest, happiest, and most prosperous of all New Years.

Art Goebel of Los Angeles, flying upside-down. This pilot has broken a number of records for upside-down flight

Moline, Ill.

By W. B. Mueller

More than 63,000 miles of flying without a single accident is the record made by the Campbell Airplane company of Moline thus far this year. Pilot E. K. Campbell of Moline, manager of the company, has issued the following tabulation of activities for the first eleven months of 1925:

Pilot	Hours in Air	Miles
E. K. Campbell	446	35,680
G. D. Scheppers	75	5,625
Dr. C. C. Sloan	38	2,850
Floyd Ketner	64	4,800
L. V. Webster	40	3,000
Al Hedlund	22	1,650
William Soebbing	11	825
Horace Mallette	9	675
R. T. Quinby	75	5,625
Harold Vogel	14	1,050
L. V. McElvain	21	1,575
Totals	815	63,355

Passengers carried	4,362
Students trained	18
Estimated attendance at field	150,000
Number of visiting planes at field during year	243

A little rock sucked up and hurled by the propeller of a visiting Jennie was responsible for the only accident of any

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kind at the field during the year. The engine of the Jennie was being warmed up and E. K. Campbell, standing by the wing, was struck by the rock. It crushed his thumb.

Officials of the National Air Transport, Inc., have indicated that they are well pleased with the progress being made in preparation to accommodate air mail planes of the Chicago-Dallas route, which will be in operation March 15. The new hangar, built at a cost of $7,500 by the Moline Chamber of Commerce, is completed. A giant floodlight is to be installed to accommodate night flyers. Moline, the smallest town on the new route, has done more than any of the rest, according to a letter from Luther K. Bell, traffic manager of the National Air Transport, Inc.

Mr. Bell, at Col. Paul Henderson's request, has written that test flights may be started over the route not later than February 1. Leaving Chicago, the planes will follow the Chicago-Omaha route as far as Cordova, Ill., a few miles east of Moline, and from there the pilots may see the tri-city lights.

United States Air Forces

U. S. ARMY AIR SERVICE

Flying Instruction

The next examination for appointment of flying cadets, it has been announced by the War Department, will be held on January 12, 1926. Only enlisted men of the Regular Army and civilians are eligible for this appointment, and at the time of application, the candidates must be (1) unmarried citizens of the United States; (2) between the ages of 20 and 27 years; (3) high-school graduates, or must possess the equivalent of a high school education; (4) of excellent character; and (5) of sound physique and in excellent health.

Examining boards will be conducted at the following stations: Mitchel Field, L.I., N.Y.; Phillips Field, Aberdeen, Md.; Bolling Field, Anacostia, D.C.; Langley Field, Hampton, Va.; Maxwell Field, Montgomery, Ala.; Chanute Field, Rantoul, Ill.; Scott Field, Belleville, Ill.; Selfridge Field, Mt. Clemens, Mich.; Hq. 1st Corps Area, Boston, Mass.; McCook Field, Dayton, Ohio; Marshall Field, Ft. Riley, Kans.; Brooks Field, San Antonio, Tex.; Ft. Bliss, El Paso, Tex.; Post Field, Ft. Sill, Okla.; Crissy Field, San Francisco, Calif.; Rockwell Field, Coronado, Calif.; Panama Canal Department; Philippine Department; Hawaiian Department; Clover Field, Santa Monica, Calif.

The applicant may elect either heavier-than-air (airplane) or lighter-than-air (balloon and airship), training. Heavier-than-air training, the duration of which is 12 months, is given at the Air Service Primary Flying School and the Air Service Advanced Flying School. Courses at the Primary Flying School start Mar. 10 and Sept. 10 of each year, while those at the Advanced Flying School start Mar. 16 and Sept. 16 of each year.

Anti-Stall Gear Tested by Army

The Savage-Bramson anti-stall gear which was described in the October 12 issue of AVIATION was recently tried out at the Engineering Division, McCook Field, Dayton, O., by Army test pilots. An SE5 plane of the Skywriting Corporation of America, equipped with the gear, was flown to Dayton by Bert Collyer for the tests. Maj. Jack Savage, head of the Skywriting Corp., and Capt. Louis Bramson are the originators of the device, twelve of which have been ordered by the British Government for tests on various types of planes.

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Pilot desires position with owner of 2 or 3 seater plane to fly in Florida during winter. Prefer part salary, part percentage. Have good 28 hp. Lawrance Nestor; 2 propellers for sale, reasonable. John L. Brown, Momence, Ill.

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PUBLISHER'S NEWS LETTER

During the early part of each year a publisher usually makes plans to give his readers a better and more acceptable paper. It is with a truly grateful spirit that we do this annual task for 1926, as this year marks the entry of AVIATION into its tenth year of service to its readers. More will be said at the appropriate time about this anniversary, but now it is most fiting that our readers should be told the part that they have played in the growth of the paper to which they have given such emphatic evidences of their support. A few years ago, AVIATION was pleased to circulate to about four thousand subscribers in this country and abroad. It made public this fact through the usual publisher's audits that are so generally used as a yard stick for the measuring of a publication's value. AVIATION was the only aeronautical paper that made such sworn statements. With the recent increase of its readers, AVIATION is now printing over eight thousand copies a week and all but a very few are paid for in advance. This means that over thirty thousand copies of this small paper circulate every month of four weeks and forty thousand in five-week months. Such a growth should be acknowledged with appreciation by a publisher, and gratitude expressed.

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But the mere growth in numbers is not the most interesting part of this expression of esteem. The greater interest lies in the fact that as this paper is edited for those who have some direct contact with aeronautical affairs, there must have been a corresponding growth in the field that we try to serve. There are papers that serve other classes of readers and we wish them well, but the pleasing fact, that we are recognizing now, is that without making any special effort to increase our list of readers, they have become a group, the size of which must represent the most influential part of the American aeronautical world.

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When we say that no effort has been made to increase our circulation, this statement may be misunderstood unless certain other facts are given. During this period of growth, the advertising rates of AVIATION have not been increased. A monthly paper can be used twelve times a year without a large outlay but when the same space is used weekly, fifty-two is the multiplier that has to be used in computing costs. While AVIATION publishes more advertising than any other paper it is spread out thinly over several issues. To increase the rates would only make the regular use still more difficult. The increased circulation service has therefore been given to our advertisers without extra cost. If foreign weeklies are compared with AVIATION it will be seen how generously and regularly they are used by foreign aeronautical firms.

* * * *

The reason for this seems to be that in most cases the aeronautical companies abroad are anxious to avoid being placed in the munition class of constructors, that are only interested in what they can get out of the government and do not wish to help build up a broad commercial industry. As exceptions in this country, we can mention the names of Wright, Curtiss and Martin as examples of companies that have always believed in creating good will by telling the aeronautical public about their products. We will not mention by name some of the other American aircraft manufacturers who rarely if ever, have their names mentioned in the advertising pages of the only weekly. Our readers know them by the very omission. They do not want your good will and do not deserve it. If they did, they would put the merits of their products before you, and in this way help us give you a better paper.

* * * *

Now what does this all mean. Plainly, that our readers are the main support of the paper and in spite of the lack of support from some of the greatest seekers of free publicity in the world, it will keep on as it has done for the last ten years giving an independent point of view to its readers every week. When we hear of contracts that amount to hundreds of thousands of dollars being given by the government to companies and note that these same companies are not contributing anything to the upbuilding of the aeronautical industry except in their own selfish way, we are often tempted to give greater emphasis to the munition phase of the aircraft industry. To our readers, therefore, we pledge our best endeavor to improve the contents, and as the advertising grows, put this increased revenue into making a larger, a more readable magazine.

* * * *

One of the gratifying results of the editorial policy of the past year has been the complimentary letters that were received from fliers almost every day. To determine what is wanted by them requires constant contact with the men who are really keeping aviation going in this country. As they are located from coast to coast, letters are the best means we have of learning their views. We receive so many interesting letters that we have decided to publish, as often as possible, parts of these letters that we feel will be of interest to our readers. Unfortunately, we will have to do this in small type as our space is so crowded. We are, therefore, mentioning it at this time for we believe that our readers will find this feature of the greatest interest. L.D.G.

The Aircraft Service Directory

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We Operate Airplanes for Every Commercial Purpose
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New Standards New OX5, 1100.00. New SJI Gov. Overh. OX5 900.00. New OX5 motors less tools, 500.00. Government Overhauled 250.00. New OXX6 motors less tools, 600.00. Short time OXX6 motors, 300.00.
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